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Volume V FEBRUARY, 1935 Number 1

SPECIAL METHODS AND PSYCHOLOGY OF THE ELEMENTARY-SCHOOL SUBJECTS

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Volume V **February, 1935** **Number 1**

Special Methods and Psychology of the Elementary-School Subjects

(Literature reviewed from October 1, 1931, to July 1, 1934)

Prepared by the Committee on Special Methods and Psychology of the School Subjects in the Elementary School: Frederick S. Breed, Clifford Woody, Josephine H. MacLatchy, L. J. Brueckner, and Arthur I. Gates, *Chairman;* with the cooperation of Vernon Jones, Harry A. Greene, S. C. Garrison, Ruth Strang, William S. Gray, Samuel Ralph Powers, and Edgar B. Wesley; and with the assistance of Mildred Van Nest, Ernest Horn, and G. A. Yoakam.

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FOREWORD

THIS number of the *Review of Educational Research* continues to exhibit the advantage of the narrower span of time covered by the reviews of the second cycle of topics. The authors have been able to summarize the results of the studies they review as well as to point out the problems attacked. Some of them go even beyond this and add general summaries of the studies as a whole. This means that the reader may get a fair idea of the findings on a given subject even without consulting the original sources.

A new plan of making the reviews, suggested in the annual meeting of the American Educational Research Association, has been tried by Dr. Gray in his review of reading, namely, the plan of getting cooperation and criticism from other specialists. If this procedure meets with approval it may be adopted by other reviewers.

FRANK N. FREEMAN,
Chairman of the Editorial Board.

INTRODUCTION

THIS number of the *Review of Educational Research* represents a consolidation of the materials previously reviewed in two issues: *Special Methods in the Elementary School* and *Psychology of the School Subjects.* The change was made to avoid the alternative difficulties of overlapping or incompleteness, which the publication of two reviews on closely related topics produced.

The present issue includes all of the topics treated in the two former volumes with exception of the following: music, which is difficult to divide into elementary- and secondary-school levels and which has been reviewed in the issue covering the latter level; and handwriting and industrial arts, in which fields the studies were too few to justify a report.

The editorial committee will welcome comments on the experiment embodied in developing the review of studies in reading. The plan used is explained in the introductory paragraphs of the chapter. Suggestions of other methods of attempting to make the *Review* more comprehensive and serviceable will also be welcomed.

All reviews herein cover the literature published between the period surveyed in the preceding *Review* on the topic and July 1, 1934.

ARTHUR I. GATES, *Chairman,*
Committee on Special Methods and Psychology of the School Subjects in the Elementary School.

CHAPTER I

Activities in the Nursery School, Kindergarten, and Elementary Grades

ACTIVITY—doing as a way of learning—has been the accepted method in the nursery school and kindergarten, and the version of it suited to the grades of the elementary school is being sought by eager investigators. The prevailing interpretations now practiced in the nursery school, the kindergarten, and the first grade expressed as the consensus of large groups of teachers and specialists are given by Langdon (56). The ratings on the list of activities were made by 1,624 teachers and specialists, representing 188 nursery schools, 722 kindergartens, and 711 first grades, and came from public and private schools of cities of all sizes.

Methods in the nursery school are concerned with the acquisition of habits of personal care, of play with others, of working with materials. In the kindergarten these activities must have an end and are judged by the purposes for which they were intended. The issue in the first grade is often clouded by the subjectmatter demands imposed by the higher grades. The reader may judge here the consensus interpretations given by Langdon by recourse to references to some of the research studies of the past three years bearing on the topics.

Habits of Personal Care

Nursery schools—The teachers in the nursery school are concerned with the child's achieving independent habits of eating and the custom of accepting the food set before him. They are intent upon his learning habits of resting quietly, relaxing, and sleeping. They are most concerned with his physical welfare.

No studies were found appraising ways of teaching a child to eat or of enticing him to relax. Three collaborators (84), however, after checking the dietaries of 163 nursery-school children with their health records, suggested a new standard of calory distribution in diets for two-, three-, and four-year-olds. Vance (95) and Prentiss and Jones (77) reported food preferences of young children. Prentiss and Jones found that the older children in nursery school refuse food less often than do the younger children and more often ask for second helpings. Scott (85) found the mean length of a nap was 73.75 minutes, and the average going-to-sleep interval was 38 minutes. Shinn (86) found that naps grew shorter and the tendency toward napping grew weaker with the four-year-olds and five-year-olds. Conrad and Jones (13) found that infectious colds caused a large percent of absence in the nursery school of the University of California, while

Updegraff (92) found that among nursery-school children the incidence of communicable disease was 8.8 per hundred; among children not attending the nursery school it was 18.9 per hundred.

Kindergarten—Kindergarten teachers place emphasis upon socially acceptable table manners. They are concerned with the need of rest after strenuous exercise, and consider the protection of the children's health important. No studies were found appraising these activities in the kindergarten.

Elementary school—The intentions of the first-grade teachers resemble those of the kindergartners in regard to habits of personal care. No studies of these phases of child life were found in the elementary grades.

Development of Social Behavior

Nursery school—Langdon (56) found that nursery-school teachers place "major emphasis on those acts directed toward the guidance of the children in learning independence in personal care, self-control, respect for property rights, and beginnings of consideration for others."

Greene (29) found that children who had attended nursery school reacted more positively in kindergarten than children who had not, and any maladjustment that they showed was traceable to boredom originating in duplication. Ezekiel (24), using only four subjects, found that children dominantly egocentric on entrance to nursery school make few changes during the first three months, but unaggressive children become more egocentric in play. Updegraff and Herbst (93) found that three-year-olds made more verbal suggestions to their partners in play and accepted more suggestions, talked more to them, and were more cooperative than two-year-olds. They also reported that behavior of a social and cooperative type occurred more frequently during play with clay, while non-social and non-cooperative behavior had higher frequency during play with blocks. Green (28) found that while playing with sand the children were most quarrelsome. Kawin (52) found certain home factors significantly related to the child's social adjustment: the social and economic status of the child's family, the relationship and attitude of the father to the child, and the agreement of the parents in regard to the child's training.

Kindergarten—The consensus of kindergartners is that with five-year-olds emphasis should be placed upon independence in thinking, respect for property rights, taking turns, neatness and orderliness, and consideration for others (56).

The experimental studies related to this topic, rather than dealing with ways of developing these social traits, are concerned with verifying their presence and measuring them. Williamson (102) found from ratings given 125 kindergarten children on the Adams-Kinsman Chart for Recording Individual Interests and Progress in Kindergarten that self-dependence and responsibility are affected more by the age of the child than by his position in the family, by the supervision of nurse or governess while at home, or

by previous attendance at nursery school. Bacon (5) described a rating chart for thirty-five traits devised by a group of kindergartners the use of which was "feasible and desirable." They found that measurable improvement in these traits occurred during the year in the kindergarten. M. L. Fisher (26) discussed measured differences between problem and non-problem children, and Remer (80) studied the traits which handicap children entering the kindergarten.

Elementary school—No studies of activities in the elementary school gave objective evidence of the development of social attributes or of ways of improving them. The adaptation of some of the technics now being used on other educational levels could effectively be used in the devising of tests suited to measure these traits in children.

Uses of Art Materials, Books, and Music

Nursery school—Langdon (56) found that in the use of the materials of manipulative and fine arts the major attention in the nursery school is given to free and incidental experimentation with clay, paints, and pencils, but that practically no attention is called to the finished product; emphasis is given to acquaintance with books and pictures, and to the enjoyment of music.

Olney (74) found that pictures with mechanical content are highest in attention value, and those with dramatic content next highest. Color enhanced the attention value of the pictures. Freeman and Freeman (27), in investigating the interest of children in picture books, found a marked preference for brightly colored illustrations of simple and familiar subjects. Arlitt and Palasky (3) found that among two-, three-, and four-year-old children colored pictures were preferred to black and white in the same proportions; but there was a gradual increase with age in the percent that chose harmoniously colored pictures as against pictures lacking in color harmony. Jasper (48) found no positive relationship between either mental age or rhythm in tapping and the recognition of graphic rhythm, but there was a positive relationship to chronological age. Knauber (55) found that nursery-school children will attempt to draw things that are new and interesting without regard to pattern and that differences in interest in drawing are discoverable even among two-year-olds.

Kindergarten and elementary school—Attention in fine and manipulative arts in the kindergarten is given to the product in terms of its use in the activity being carried on. The children are encouraged in the handling and use of books, in listening to stories, and in retelling stories themselves. In music, emphasis is placed on the acquisition of skill in singing and rhythmic expression with less emphasis than in the nursery school on the enjoyment of music.

Again the studies to be reported are exploratory, determining the abilities of the children, but the findings of such studies can contribute to the meth-

ods used and purposes set. A series of art studies has been carried on at the University of Iowa in which children between the ages of two and ten have been the subjects. Meier (68), director of these studies, stated that in one group of studies the hypothesis accepted was that various phases of artistic capacity probably have a genetic emergence:

> The studies in their findings point to the conclusion that children not only do respond positively to the more fundamental esthetic qualities or principles but do so, as in the case of balance (15) and rhythm (48), as early as the second or third year in certain individuals and by the fifth year in significant group averages. Unity (99) and fitness show up in group averages several years later but color harmony (100) not until nearly the twelfth year.

These findings tend to support the view that " 'esthetic intelligence' as an important element in artistic genius matures early in life." The second group of studies (20, 31, 83, 90), in which children from five to ten years of age were subjects, led to the conclusion that "the artistically promising child is marked by the way he responds to his visual world." Knauber (55) found that kindergarten children are more interested in drawing things for which they have learned a pattern. Mellinger (69) found that children in the first, third, and fifth grades are more interested in colored pictures than in the same pictures in black and white, and that they prefer realistic to conventionalized pictures. Gunther (32) found that by manipulating raw materials in an activity situation, pupils of the third, fourth, fifth, and sixth grades learned their characteristics and properties better than by conventionalized instructional methods.

No studies were found dealing with story interests, and only one study in music in which the conclusion was that "the mean pitch level used by preschool and primary children is significantly lower than the pitch level for the same songs as they are printed in song books for those ages." The mean pitch range of the children studied was 9.5 semitones as compared with 10.5 semitones of the children's song books. Extensive practice and instruction over a period of five weeks had no significant effect on the pitch level of the children's singing (37).

Play

Nursery school—Langdon (56) reported that the emphasis in play activities in the nursery school is given to acts which follow the choices of the children and "supplement their interest with information or help in achieving skill in things spontaneously attempted." In the use of play materials the nursery-school teachers emphasize free experimentation with many materials, and some guidance is given so that the children will discover their possibilities. No effort in dramatic play is made toward the achievement of any purpose other than the children's spontaneous activity.

Arrington (4) found that two-year-olds spent about three-fourths of their free time actively experimenting with material, one-eighth in activity not

involving material, and one-eighth in passive pursuits. Dow (20) found that artistic children responded more to equipment and less to physical activity and social play than non-artistic children. Arrington (4) and Beaver (8) found that the number of social contacts in play increase with age and become markedly more verbal in character. Parten (76) found social participation dependent to a large extent on the age of the child. Van Alstyne (94) found marked differences in usage of materials which correlated positively with chronological age. Benjamin (10), studying the toy preferences of boys and girls, designated some toys as masculine toys and others as feminine.

Kindergarten—Play in the kindergarten is more purposeful than in nursery school. Emphasis is put upon discrimination in the selection of materials to be used in carrying out some activity in which the children are interested. The teacher follows the lead of the children, but tries to stimulate them to discuss the results obtained.

Hubsch and Reininger (45) found that the play activities of kindergarten children must have meaning or names that suggest meaning to the children, but the children do not generally ornament, change, or animate the games and playthings. In the selection of playmates, girls tend to form cliques based upon personal attachment, but boys join together in cooperative groups.

Elementary school—In the Langdon survey (56) the attitude toward play in the first grade only is discussed. Attention there is centered on "definitely organized group activities with little apparent attention to play of an individual nature." Emphasis is on the use of materials in carrying out some activity and the critical evaluation of results achieved through their use. In dramatic play emphasis is put upon planning and carrying out the activity and following the pattern of the story set up, with group discussion of the results.

L. E. Wright (104) told of a "first grade at work" in Lincoln School in which activity with no formal instruction in reading was the source of the information gathered. Crawford and Gray (14) found that an activity built around a puppet-show in a fifth-grade English class resulted after five months in an average vocabulary gain of 7.8 months, a reading comprehension gain of 8.1 months, and a language usage gain of 8.1 months.

Learning, Language, and Subjectmatter

Nursery school: learning and language—Few verbal generalizations are made concerning experience in the nursery school, but the child is shown frequently how to do some act with as little explaining as possible. There is practically no effort to make the child critical of his own work, and group opinion is rarely used.

Matheson (67) found that the most frequent responses to a learning situation of a group of children, ages thirty to fifty-four months, were

those of trial and error and "feelings of incapacity." Harter (36) found considerable over trial and error in attack on non-verbal problems; successful children tended to be older chronologically and mentally. Roberts (82) found that learning ability is more closely related to mental age than to chronological age, but that the application of the solution to similar solutions was not as much a function of mental age as was the learning of the solution. Hilgard (40) and Jersild (49) gave evidence of the importance of maturation as a factor in learning. Roberts (81), with groups of children from two to five years nine months, found that all children solved the problems in which a single relationship was held constant, but not all of them discovered the principle involved. In all groups except the two-year-olds, there was a reduction in number of trials from early to later series which tended to increase with age. Grigsby (30) found that in the development of concepts of relationships gradations of maturity were affected more by mental age than by chronological age. Chase (12) found evidence in favor of some incentive for the child above that of knowledge of results. Emmons (23), computing self-assurance on a seven-point scale, found that it is correlated positively with skill, chronological age, and intelligence. Pyles (78) found that verbalization served as a distinct aid in learning and that interest factors influence learning. E. A. Davis (16), investigating the questions asked by boys and girls between the ages of three and twelve years, found no age or sex differences in the tendency to ask a series of logically related questions starting from a single topic. The younger children did not ask questions at a rate faster than the older children, and their questions contained fewer words than those of the older children. The interests of the younger boys and girls seemed similar. Younger children ask more questions of cause than older children. Of the questions asked, 86 percent were asked of adults, and 13 percent of children; 88 percent of the questions seemed to result from the immediate situation and 11 percent from remote events.

M. S. Fisher (25) found that language patterns are more clearly related to chronological age than to mental age; that at the age of five children have acquired all of the language patterns used by adults in ordinary conversation; and that the language patterns used by children reveal them to be egotists and yet sociable. Arrington (4) found the vocalizations of two-year-old children to be predominately non-social; at three years the social vocalizations predominated. The findings of H. M. Williams (101), who measured ability to produce speech sounds, language usage in communication speech, and vocabulary, indicated considerable specialization of function in language.

Wellman and others (98) found a high correlation between ability to give speech sounds correctly and chronological age. When the chronological age was held constant, there was no correlation with mental age. Final sounds were more difficult than the initial or medial sounds, and nasals were easier than stops and fricatives. Three-year-old children sounded cor-

rectly 82.5 percent of diphthongs, 75.2 percent of vowels, 68.4 percent of consonant elements, and 51.8 percent of consonant blends. Sommer (89) found that preschool children with articulatory defects showed improvement in articulation after a twelve-weeks' interval regardless of whether or not they had been trained systematically during the interval, but the improvement in the trained group was 57 percent; in the untrained, 28 percent.

Nursery school: subjectmatter—Langdon (56) said that, in guiding the children to an understanding of number, attention in the nursery school is given to the incidental understanding of words denoting time, space, and distance. Simpkins (87) recorded while observing nursery-school children 132 occasions on which numbers were used by the children. She noted few instances of oral counting; most of the numerical experiences dealt with the object seen, handled, or touched. Numbers were constantly and consistently used in conversation and during play. Terms, such as "quart," "pint," "mile," "block," "dozen," "add," "dollar," which the children had heard used and remembered, appeared in their conversation. Grigsby (30) found that three-year-old children could count to an average of 1.64, and four-year-olds to an average of 12.44. McLaughlin (64) found that the "aggregate 2" was known by some of the nursery-school children she tested in the third year of age and by all of them in the fifth year; 3 was known by the brighest in the third year, by two-thirds in the fourth year, and by all in the fifth year; 4 and 5 were recognized by some in the fourth year and by more in the fifth year. In the fifth year, groups to be counted were counted by ones or broken up into smaller aggregates. She also concluded that the recognition of aggregates is closely associated with "maturity in counting which is the *sine qua non* of its development." Nursery-school teachers should be conscious of the importance of this early familiarity with number.

Kindergarten: learning and language—Group discussion is frequently used in the kindergarten as a means of judging the value of the activity in which the group is engaged. Generalizations are often drawn from experience. Telling and explaining are frequently used rather than showing how an act is done. Interest is often stimulated by telling the children about happenings or events which have occurred outside their immediate experience.

Jones and Dunn (50) used four sets of stimulus cards, each set presenting systematic changes in a single variable, to investigate relative choice of kindergarten children. They found wide individual differences in the tendency toward relative choice. The frequency of relative choice was related to the efficiency with which discrimination was established in the training series.

In the investigation of Wellman and others (98) the percents of five-year-old children who could give correctly the sounds of diphthongs, vowels, consonant elements, and consonant blends all closely approached 90. Sommer (89) found that the amount of improvement in articulatory defects

was approximately the same in the kindergarten control and experimental groups as in the similar nursery-school groups.

Kindergarten: subjectmatter—Direct attention in the kindergarten is given to the use of number in the activities of the day, and attention is sometimes turned to various quantitative relationships. No attention to reading instruction is given, but through listening to stories read to the group and through familiarity with picture books, the child's readiness for reading is developed.

Simpkins (87) reported 333 references to numbers made by the members of the kindergarten group which she observed. Evidences of the use of counting appeared 2,817 times, and counting in unison was noted several times during play. Uses of the fundamental processes appeared 118 times: addition, 39 times; subtraction, 11 times; multiplication, 28 times; and division, 18 times. Mentions of fractional parts were common; terms of measurement, "quart," "pint," "nickel," "penny," "dollar," "two-cent stamp," were used; meaningful terms, "whole," "double," "both," "add," "pair," were overheard; and items in serial order, first to fifth, were referred to. Grigsby (30) found that five- and six-year-old children could count to an average of 19.05 and 26.5, respectively. MacLatchy (63) found that the incidental number experiences of the kindergarten gave to 708 six-year-olds at Cincinnati higher percents of familiarity with certain addition combinations than were attained by 349 six-year-olds who had not attended kindergarten.

No direct appraisals of the methods of preparing children for reading are given, but tests of readiness have been devised, such as the reading test included in the Metropolitan Readiness Tests for Kindergarten and Grade I. Hildreth (38) found that there is considerable homogeneity in the information possessed by a group of first-grade children when they enter school. Legrun (58) gathered a sampling of writings by kindergarten children who had had no definite instruction in writing but who were asked to write letters to Santa Claus. He found several stages represented: entirely incoherent marks seemed the earliest stage; then flowing lines in a horizontal direction; then a profusion of waves and zigzags; and finally the appearance of letters and figures. Hildreth (39) found that the ability of four-, five-, and six-year-old pupils to write numbers and letters progressed from a low to a high degree of success.

Elementary school: learning and language—No studies involving elementary-school children in which learning itself was isolated for study and only one in which language was especially differentiated from subjectmatter content were found.[1] E. A. Davis (16) found that the distribution of causal questions by age of children shows a drop occurring at about the time the child is learning to read. There is an increase in the number of questions of calculation with the beginning of the school age, but the dif-

[1] The facts regarding children's understanding of what they see in a moving picture and their tendencies toward retaining the information so gained have implications for education which the school cannot afford to overlook. See Holaday and Stoddard's *Getting Ideas from the Movies* (42).

ference is not statistically significant. Language is the chief vehicle of instruction in the elementary school. Many schools, frequently designated as "progressive," are attempting to present the information to be learned in a meaningful context and to deepen understanding through the manipulation of related materials so that the process of learning may more closely resemble experience.

Elementary school: subjectmatter—Three studies were found in which conventional methods were contrasted with activity programs. Tutt (91) by a test found that first-grade children learned more words during a daily workbook period than during a daily activity period in which some reading was involved. Lee (57), testing 3,822 first-grade children in 144 classrooms, found that pupils whose programs involved a "great deal" of activity made a median score of 1.3; those doing "some" activity, 1.7; those having "very little," 1.5 and those (14 pupils) having none, 1.9. He concluded "that pupils in classrooms doing a great deal of activity work do not learn to read so well as do other pupils." MacLeod (65) compared the records of first- and second-grade pupils in art, music, hygiene, language, and nature study taught by "activity methods" with records in reading, spelling, arithmetic, and writing taught by traditional methods and concluded that first-grade children profited most by the activity methods.

The accounts of unit studies at the Lincoln School of Teachers College, Columbia University, which covered a year's work in each grade, grade two, *Carrying the Mail* (46); grade three, *Indian Life and Dutch Colonial Settlement* (53); grade four, *Adventuring with Toys* (22); grade five, *Ships and Navigation* (7); and grade six, *Children and Architecture* (6)—tell of activity programs carried on under almost ideal circumstances, with small selected groups, well-trained teachers, unlimited supplementary opportunities in the way of museums and libraries, and varied environmental facilities. In each of these studies, progress measured by a standardized test of reading, spelling, and arithmetic covers little more than a year's span on the test. Unfortunately, no measure is available to estimate the progress, mentioned by each teacher, in attitudes, interests, and habits.

Through the cooperation of a fifth-grade teacher at Cleveland, Harap and Mapes (35, 66) studied the progress of a group of pupils learning multiplication of fractions through manipulations of fractions in real situations, such as manifolding recipes for candy, toothpaste, glue, and the like. The value of these intensely interesting accounts could have been greatly enhanced had the experiment been preceded by checks of the children's familiarity with the multiplication of fractions and followed by measures of their ability to apply this knowledge in the manipulations of a variety of fractions and to transfer its use to other situations. In the reviewer's opinion there would have been no weakening of the activity value of these experiences had the learning period been extended to include analogous workbook exercises taken from other fields which could have resembled

in form the exercises used by Tyler in testing university students' power to draw inferences.[1]

Studies of another type which yield material informing both to the teacher, interested in the use of activity methods, and to the research worker, interested in the nature of the processes involved and the subjectmatter covered, bear the titles, "Number Situations and Concepts in a Third-Grade 'Activity' Setting" (97), "Letter Writing in Elementary Schools" (21), "Implications of Guidance in First-Grade Teaching" (54), and "An Activity Program as a Means of Americanization in the Primary Grades" (34). Three of these master's theses were written by teachers in the Laboratory School, Ohio State University, during their terms of office. Each is based upon a diary account of actual happenings in some phase of the work in her classroom. For example, the first thesis mentioned lists and describes the situations involving number which arose in the process of the four units of work—a pioneer study, an Eskimo study, the Dutch study, and a study of prehistoric life—engaged in during the year. Diary records in still greater detail are to be desired before it will be possible to determine those parts of knowledge which must be learned specifically and those which may be learned by implication and analogy. The authors of the "Unit Studies" from Lincoln School would have greatly increased the value of the reports to research workers and curriculum specialists had each listed, for example, the arithmetic facts used and the number problems solved by the class in the course of each unit.

Hopkins (43), editor of the series, said that in his opinion there are "essentials common to all types of elementary-school curriculums," and presented figures gathered from standardized test scores which lead to the conclusion that the "children in Lincoln School learn these essentials as well as children of like age, grade, and intelligence in general school population, even though in Lincoln School such essentials are considered of relatively less importance and are given relatively less attention than in the subject curriculum." To safeguard the "skills" which the traditional school accepts as essential to the early steps in learning, a school at Long Beach over a two-year period, although organized on an integrated program, allotted an hour a day "to those skills not growing out of the units of work" (44).

Morrison (72) attempted to compile criteria for judging activities. Meriam (70) examined the records of more than a thousand activities, searching for common elements. Carey, Hanna, and Meriam (11) compiled a list of more than 7,000 projects. F. Wright and Nossing (103) collected a list of music materials which will be useful in an activity-curriculum. Long (60) discussed the physical facilities needed for activities, and Adams (1) has investigated the problems of initiating such a program.

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[1] Tyler, Ralph W. "Measuring the Ability To Infer." *Educational Research Bulletin* (*Ohio State University*) 9: 475-80; November 19, 1930.

CHAPTER II

Arithmetic

THIS summary is based upon 96 books, monographs, and articles published from July 1, 1930, to July 1, 1934. The close relationship between the present volume dealing with special methods in the elementary school and a previous volume involving the psychology of learning, general methods of teaching, and supervision demands a certain amount of overlapping in content and offers explanation for reviewing 39 studies which had been earlier presented in the more general treatment.

Children's Early Number Experiences

"Adjusting instruction to the needs of pupils" is a much used phrase in education, but often has little significance because there is no scientific evidence showing what the particular needs are. Investigations by MacLatchy (156, 159, 160) and Woody (197, 198, 199) presented facts concerning the knowledge of counting, measuring, and number processes before formal instruction in arithmetic is begun. Reports from these investigators reveal that children, even before the period of formal instruction in school, have considerable ability in counting, can often read simple numbers, and tell time, know the commonest units of measurement, and have some skill in dealing with simple verbal problems and simple exercises in addition and subtraction. While the success of the children on the tests submitted was surprising, Woody pointed out that many of the correct solutions were obtained very slowly and often by a circuitous method. He contended that not only the correct answer but the method of arriving at a correct solution should be taken into account in considering a child's mastery of a process and his need for further instruction. These studies by MacLatchy and Woody for the early grades are suggestive of the type of studies which should be undertaken for each age and grade in the elementary school.

Mental Age and Achievement in Arithmetic

Washburne (191) and his Committee of Seven, in attempting to determine whether there is such a thing as mental readiness for learning an arithmetical process, concluded, on the basis of five years of investigation involving 148 cities and many thousand pupils, that there is a stage in a child's mental growth, before which it is ineffective, if not futile, to teach the topic, but after which most children can learn it with reasonableness. His conclusion that no topic in arithmetic should be taught to a child until he has reached such a skill in the prerequisite topics and such a mental age level that he

will have at least three chances out of four of learning the topic sufficiently well to pass a retention test six weeks later with a score of 80 percent or more, may be accepted as a working hypothesis; but the reviewer feels that much varied and intensive investigation must be made before proclaiming the optimum mental ages for teaching the various topics in arithmetic. No doubt, the effect of variation in the organization of subject-matter, the nature of previous instruction, the type of instruction in each unit, the duration of the period of teaching, and other similar factors influencing the achievement must be eliminated before the final establishment of an optimum time for teaching any given topics. Washburne (192) in another article indicated two reasons why pupils fail in arithmetic: insufficient mental development, and inadequate mastery of "foundation knowledge." Gillet (138), using the results of Washburne's Committee of Seven, presented the minimum ages requisite for mastery of eighteen topics in the fundamentals of arithmetic.

Ford (136) made an investigation involving three groups of 100 pupils in grade five in 23 schools of Louisiana having the following mean I.Q.: 118, 99, and 77.6, to determine which group made the most favorable ratio of success in given learning exercises as a result of a period of twelve weeks of instruction. He found the higher the intelligence the higher the net gain in scores made on the history and arithmetic tests, but the lower the intelligence the less the relative net gain. A. W. Brown and Lind (113), working on this relationship of achievement to mental age with feeble-minded and dependent children, concluded that the relationship depended not so much upon the level of intelligence as upon the position of that level in the group receiving instruction. Even among dull as among bright children the relatively bright children of the group are not working up to capacity.

Grossnickle (141) found no relation between intelligence and accuracy in solving problems by methods of long and short division or between speed and accuracy. However, he found that the pupils in the upper half in mental ability had greater speed in short division than those in the lower half. Bowman (111) reported that pupils of high ability showed no distinct preference for the types of problems which they liked best; that they performed equally well on all types presented; and that pupils of low ability preferred and performed better on problems involving no complex situations. Sauble (182) discovered that pupils in all intelligence levels profited almost equally well from the increased time devoted to the drill in the fundamental operations in grade two. She indicated that the over-age pupils profited most from the increased time expenditure. Osburn and Foltz (170) signified in their study on the permanence of improvement in the fundamentals of arithmetic that the brighter students, except those making scores near the top of the first test, made larger gains as a result of a program of remedial instruction and made smaller losses during the summer vacation. Brownell (116), in his investigation on the use of "crutches," reported no relationship

between the retention of the use of the "crutch" and chronological age, mental age, intelligence quotient, or separate measures of arithmetic ability. F. T. Wilson (194), in attempting to ascertain the effect of the form of a combination in the learning of a multiplication table by bright and dull children, reported that: (a) there was no essential difference in the difficulty of the two forms used; (b) the hardest combinations for the dull children were also the hardest for the bright, and vice versa; and (c) the learning process seemed to be much the same for bright and dull pupils. Both Overman (172, 173) and Osburn and Drennan (171) found much greater transfer of training among the brighter pupils. While the scope of most of these investigations has been narrow, the investigations point to three conclusions: the relative independence of mental capacity and certain types of achievement; similarity in the patterns of learning of bright and dull children; and the greater amount of transfer among pupils of higher mental ability.

Method of Teaching

Subtraction—G. M. Wilson (195), basing his article on Allen's master's thesis at Boston University, reported results of 400 returns from instructors and teachers in 23 departments of education, 162 cities, and 215 training schools. These results revealed that 48 percent of the total replies used the "take-away-borrowing-upward method." Among this group the take-away method is used nearly three times as often as the additive; the borrowing or decomposition method, two and one-half times as often as the equal-additions; the upward method, six times as often as the downward. These results seem to have real significance and may be a cause of many pupils, even though taught by the additive method, reverting later to the take-away method. Furthermore, the fact that teachers favor the take-away-borrowing-upward method may contribute to the difficulty of permanently establishing any other method of teaching subtraction, even though experimental studies may indicate that other methods result in superior achievement. Johnson (149) found in an investigation, involving the responses to devised tests in subtraction made by 693 individuals, ranging from those in grade five to those in the normal college and university, that the individuals using the equal-additions method were 3.35 percent more accurate and required 14.3 percent less time than the group using the decomposition method. This finding is similar to the results given in a majority of the studies reported in other sources published previous to the period covered by this book. The experimental evidence seems to favor the additive method, yet as Wilson's investigation revealed, usage tends to favor the take-away method. Since the actual difference between the two methods is small it may be that more important problems can be found for future investigation. At least there is need for better controlled and more extensive investigations measuring the effects of the method of teaching, not only on the mere fact of learn-

ing the combinations per se, but on the influence of the methods as they function in the various arithmetical processes.

Short versus long division—A suggestion by a recent authority on the teaching of arithmetic to the effect that long division should be taught before short division has created much interest in the problem. Olander and Sharp (167), in an investigation involving 1,265 pupils in grades four to twelve in four school systems, found that three out of four pupils prefer the long division form and that those using this form are more accurate than those using the short division form. They concluded that "teachers should not only teach long division first, but that they should teach it as the regular method that will be used by the majority of the pupils." Grossnickle (141) found that the long division form was superior to the short division form in securing both speed and accuracy in dividing with a one-figure divisor. His conclusion was based upon results obtained from 2,365 pupils in grades five to fifteen. It is highly possible that if long division, as advocated by these investigators, were the only method of division taught, the grade placement of short and long division as reported by Washburne would be somewhat altered.

Grossnickle (140, 142, 143) reported three investigations involving the method of estimating the quotient. After analysis of 44,550 examples he recommended the use of the "apparent method" of estimating the quotient for all two-figure divisors ending in 1 to 8, inclusive, and that divisors ending in 9 be increased by 1. After analyzing and counting the opportunities for practice in estimating the quotient, he found a wide range in the amount of practice offered. An analysis of nine different texts for grade three to six for cues in problems in division showed that 25 cues for one-step problems and 4 cues for more than one-step problems appeared in at least six of the nine books. While there was much variation in the number and type of cues given, the author argues that the list of 29 cues should constitute a core of minimum essentials for grades three to six.

Learning conditions—F. J. Brown (114) asked whether, under normal classroom conditions, progress in arithmetic is greater when pupils know their scores than when they do not know them. In a carefully controlled investigation involving 138 pupils in grades 5A and 7A divided into groups matched according to intelligence and teacher ratings, and serving first as a control and then as an experimental group, he found that knowledge of results tended to increase efficiency in drill in the four fundamentals in arithmetic. He found that boys were more susceptible to this influence than girls.

Sauble (182) matched classes in grades 2B and 2A with classes in the same grades, with the same mental ability, age, race, nationality, teachers, materials, and methods, except that the experimental group spent an extra ten minutes in drill on the combinations. He reported that the additional results obtained were not proportionate to the extra time expenditure. There was virtually no difference in the gains in grade 2A, although the extra

time brought some increased achievement in grade 2B, especially among the over-age pupils.

Brownell (116) made a contribution to the psychology of learning in his investigation, involving 248 pupils in seven schools, on the effects of the use of a "crutch" in adding proper fractions. He found that the groups using the crutch did approximately as well as the non-crutch group, that both groups made the same kind of mistakes; and that the group using the crutches tended to drop them in spite of the teacher's efforts to preserve them. He concluded that none of the objections against the use of crutches, which were studied in his investigation, were found to be valid. Implications from this investigation and from a recent article (117) suggest that the crutch may be used by the child in one stage of his learning and be eliminated almost automatically as higher stages of development are attained. His investigation surely suggests the need for studying intensively the method by which a child masters any new process.

Abstract versus meaningful drill—G. M. Wilson (196) experimented for three years with substituting activities and experience for the formal drills in arithmetic in grades one and two and to some extent in grade three. He found that 475 children, in a school with a large foreign element, at the end of grade two, when tested on the 100 addition combinations, were superior to the pupils in grade two in a much better neighborhood, and better than the pupils in grade three in a comparable neighborhood. He found also that when the Wilson Survey Test was given in May to 1,034 pupils in grade three the average percents correct in addition and in subtraction were 97.8 and 95.6, respectively; the percents of children making perfect scores in addition and in subtraction were 82 and 74, respectively. Hizer and Harap (147) found that the course of study involving the learning of decimals can be organized into a series of activities without neglecting the mastery of the fundamentals. On the basis of their investigation they concluded that "it seems safe to recommend a series of child-centered activities provided they are accompanied by individual practice exercises for pupils, if and when they are needed, plus periodic tests of mastery of the essential steps." Harap and Mapes (146) reached similar conclusions. The authors, making no effort to control the order of occurrence of the steps in a process or the number of repetitions, presented results to show that pupils have understanding and surprising mastery of the subjectmatter under consideration.

Familiarity with problem situation—Six different studies are concerned primarily with the familiarity and interest of pupils in the problem situations involved in the statements of verbal problems. Brownell and Stretch (115), in an investigation dealing with the responses of 256 pupils in grade five to problems in four different settings of different degrees of familiarity as judged by teachers, found on the basis of gross scores that unfamiliarity of settings decreases the number of correct solutions by interfering with the choice of operations rather than with the quality of the computations.

They reported that there is evidence for believing that the influence of unfamiliar settings is conditioned by the difficulty, aside from the setting; the number of times a given set of number relations has been dealt with; and the amount of time allotted for solution. They furthermore found in the study of individual children that the children's choices of operations for dealing with the same relationship vary without regard to the setting; that unfamiliarity is a factor which does not generally operate; and that the pupils most affected by unfamiliarity of setting are those who are usually poor in choice of operation and in computation. G. A. Kramer (151) in a very extensive study to determine the effect of interest, sentence form, language details, and familiarity of vocabulary in grade six, found that pupils made highest scores on problems remote in interest, stated in interrogative form with plain statement and familiar vocabulary, and that they made the lowest scores on problems employing the declarative form with unfamiliar vocabulary and language details. She found that children tended to respond to cues rather than to the facts and requirements of the problems. White (193), in an investigation in grade 6B, in which 1,000 children responded to a test with twelve problems stated in familiar situations and a similar number of problems of equal difficulty stated in unfamiliar situations, found that in other than easy problems the non-familiar situation was a highly significant factor in the selection of wrong processes, in omission of problems, and in the failure to complete a problem. Bowman (110, 111, 112) reported that the order of preference of 564 pupils in grades seven, eight, and nine, when given a chance to check from a list of problems the ones best liked, was as follows: (a) computation, (b) child situations, (c) adult situations, (d) science situations, (e) puzzle situations. He found the correlation between preference and performance on the total list was .58; between preference and the preferred list, .56. These correlations suggest that preference had little influence on achievement. Both groups rate the child-type of problem high. The pupils of high ability show no distinct preference and perform equally well on all types of problems; pupils of low ability prefer and perform better on problems involving no complex situations.

The results presented in this group of studies are not consistent and may suggest to those interested in the doctrine of interest, meaningful experience, and activity teaching, the need for further experimentation. It may be that uncontrolled factors in each situation concerned are responsible for the results obtained. Each of these investigations has been based upon testing and not upon teaching situations. Furthermore, these investigations involve tests after the pupils are supposed to have developed the technic of solving the problems and whatever generalization may ensue. A caution must be added lest implications manifested in a testing situation after teaching should be applied to a situation in which a new process is to be taught. An additional caution may be mentioned lest someone will infer a causal relationship for two conditions that happen to exist simultaneously.

Method of presentation—Baker (108), after an investigation covering a period of eighteen weeks using two radio lessons per week accompanied by drill sheets and a test every sixth lesson, presented results showing the superiority of the radio schools over the control schools and claimed that results in grades 2A, 3B, and 3A are very encouraging. Zyve (202), in comparing the relative effects from presenting number combinations on the blackboard or by means of lantern slides, concluded that evidence favors presentation by means of lantern slides. This conclusion may not have significance since there were only 37 pupils in grade two and 39 in grade three, and since the novelty of the method of presentation by means of the lantern may not have worn off during the short period of the investigation. Brueckner and Hawkinson (119) and Capron (125) made studies on the order of arrangement of items in tests on the difficulty of the items. The former tested the relative effects of arranging four examples of one type on the same horizontal line and of arranging the examples of all types in random order. The latter tested the effects of arranging a series of examples from easy to hard, hard to easy, or in random order. Both found that order of arrangement has little influence on difficulty. Brueckner and Hawkinson, however, stated that, because of greater ease in scoring and analysis, all examples of a type should be placed in a horizontal row.

Transfer of Training

Three investigations are reported under this heading. Those by Overman (172, 173) and Olander (166, 169) are outstanding and suggest that the amount of transfer is greater than usually anticipated and that the amount can be influenced by methods of teaching. Overman's investigation involved fifty-two classes in grade two divided into four groups matched according to age, sex, mental age, teacher's estimate of general ability, and score on an initial test in arithmetic. Four methods of teaching were employed in the teaching of the group: specific training, generalization, rationalization, and a combination of generalization and rationalization. He measured the effects of teaching simple exercises involving addition of a single column of digits upon more complicated types of addition and subtraction. He exercised most careful controls. He found considerable transfer from each method. The methods ranked according to the greatest amount of transfer resulting were: generalization, generalization and rationalization, rationalization, and specific training. The pupils with the highest mental ages had greatest transfer with the method emphasizing rationalization. He also found greater transfer with the brighter than with the duller pupils. Olander's findings (166, 169) corroborated the implications of Overman. He found on the results obtained from 1,300 pupils in grade 2B in Detroit, Fordson, and Hamtramck, Michigan, in learning 100 basic combinations in addition and in subtraction, that the group whose instruction included emphasis on each of the 200 combinations did not make higher achievement on the informal tests involving all combinations than the group which spent its time on 110

combinations. He concluded that the 100 facts in addition and in subtraction are not learned as separate bonds, but as a system of interrelated experiences. He found that his efforts to teach by the method of generalization showed no significant effects on the scores made by the pupils taught with emphasis on this factor, but he added that every combination does not need to be taught directly. Osburn and Drennan (171), after a special thirty-day period of training in which a series of cues useful in solving verbal problems was used, found that pupils responded especially well on new sets of problems with entirely different cues. They discovered the greatest amount of transfer with the more intelligent pupils. They concluded that emphasis should be given to the thorough teaching of the most important types of problems and that dependence should be placed on transfer effect for solving other types of problems.

These three investigations seem to the reviewer to be significant and should influence teaching. They suggest that in the past many investigations may have failed to show transfer because the various elements involved in the new situations were so unlike the teaching situations that the effect of transfer could not be detected. Designers of materials of instruction should give consideration to the findings of these investigations.

Diagnosis and Remedial Instruction

Cooke (129) reported a limited investigation in which six of the poorest pupils in arithmetic in the Peabody Demonstration School were selected for special instruction based upon each pupil's errors. He concluded that individual remedial instruction is profitable. In a follow-up study made seven months later, he (130) reported that 71 percent of the difficulties found in the period of remedial instruction previously given did not recur, but that 79 new difficulties had been added. He concluded that programs of remedial instruction must be constantly followed up or much of the real value will be lost. Bush (123), in an investigation in grades four and five on the effects of training on specific types of problems and on overcoming specific difficulties, concluded that this type of remedial instruction was superior to the usual type of instruction in which unselected examples are chosen at random. Smith and Burton (185), in comparing the relative gains in computation and reasoning in arithmetic during a period in which there is no supervision with that made in a period in which a supervisory program emphasizing computation was instituted, found that much larger gains in computation and slightly greater gains in reasoning were made during the period of supervision than in that without supervision. Gerhardt (137) reported a study showing beneficial effects of a program of remedial instruction following a citywide testing program.

Analysis of errors—A few studies involving the analysis of errors appeared during the period under consideration. Olander (168), after having made copious notes on the responses of seven pupils in taking the Buswell-John Diagnostic Test, gave the original papers to 40 teachers asking them

to mark the papers and to surmise the thought process of each pupil in making any existing errors. He found that teachers in marking are greatly influenced by the pupil's method of work and that of all the surmises made as to the thought processes involved in the errors, only 29.7 percent were correct inferences. These results certainly suggest caution in attempting to make a diagnosis of the cause of error merely from the written responses on test papers. Burge (122), after employing the interview technic with 2,577 pupils in grades four, five, and six, concerning their responses to tests in multiplication, found that relatively few type errors and questionable habits of work could be analyzed with certainty from the written responses. He argued for the interview because he found that all errors and questionable habits of work had significance for the individual child and that they tended to persist throughout the higher grades. Brueckner and Elwell (120) raised a question of the reliability of diagnosis of error in multiplication of fractions. They found, on the basis of the responses of 327 pupils in grade five to a test of twenty-four examples, consisting of four examples of each of six types arranged in random order, that in 59.8 percent of the cases the pupils who solved correctly one example of a type, missed one or more of the remaining three; also that when two examples were missed the errors were different in 69 percent of the cases. They concluded that diagnosis of difficulty on the basis of a written report on a test containing but a single example of nine given types is likely to be unreliable and invalid. Knight and Ford (150), in studying the effect of position of the various digits in the multiplier or multiplicand on the frequency of error in the solution, discovered that 72.4 percent of the total errors came in the latter half of the solutions of the given examples. They found that difficulty of a combination was often conditioned by the lateness of its appearance in the solution of the example. They concluded that difficulty may be thought of as a temporary lapse in, or degeneration of, ability within a segment of work which disappears under the stimulus of attacking a new segment of work. Their discovery that difficulty of combinations is conditioned by position in an example may suggest caution in taking too seriously the significance of the studies on the difficulty of the combinations. F. T. Wilson (194) reported a simple study showing that in multiplying 67 by single digits the effect of form is negligible as the results were virtually identical whether the example were written: 4 x 67, 67 x 4, or in vertical form. Furthermore, the learning process was the same for both bright and dull pupils. His conclusions with regard to influence of position are somewhat contrary to those of Knight and Ford, but it should be pointed out that his examples were much simpler than those employed by the latter and the number of his subjects was much more limited.

Permanence of Improvement

Osburn and Foltz (170), in September, 1929, administered the Wisconsin Inventory Tests to all pupils in an entire county. On the basis of the results

they planned a remedial program and repeated the tests the following April at the end of the school year and in September after the summer vacation. They found the average loss over the vacation was less than one-fifth of the improvement made from September to April. The range in the loss was from one-twelfth to three-fifths. The brighter pupils made greater gains and smaller losses. These investigators emphasize the fact that there is a large amount of permanent improvement in the pupil's knowledge of abstract arithmetic. Sister Mary Immaculata (152), in her investigation on the permanence of improvement and the distribution of learning in addition and subtraction, found that: (a) short periods result in greater permanence than long periods; (b) distributed practice is better than concentrated practice; (c) written drills secure greater and more permanent gains than oral drills; (d) older children tend to retain more than younger children; and (e) the loss over the summer vacation is small compared to the gain from which it proceeded. She concluded that the most economical drill is secured through spirited competitive written practice, with short, distributed periods. Schorling (184), on the basis of tests in the fundamental operations in arithmetic given to 3,545 pupils in grades five to twelve and 2,693 university freshmen, found the grade medians ranged from 17.6 in grade five to 67.0 in grade twelve. He found only nine tasks out of 100 which as many as 90 percent of the pupils in grade twelve could do perfectly; only 29 items which 80 percent of these pupils could do correctly. He found only three items which could be solved correctly by 75 percent of the freshmen. He concluded that the degree of mastery of these fundamental operations is very low. If one can assume the different items had been taught the pupils tested, his results suggest lack of permanent results. However, it should be pointed out in his investigation that there was no control over the teaching process, while in the other investigation there was definite effort for instruction on the exact processes upon which measurements of permanent effects were based.

Level of Attainment in College

Carson and Wheeler (126), in giving the Woody-McCall Mixed Fundamentals in Arithmetic Test to 163 freshmen in East Tennessee State Teachers College, ascertained that 69 failed to attain the standard for pupils of grade eight. After four weeks of specialized practice, 95 percent of those placed in a remedial class attained the standard for grade eight. Arnold (107), in giving the Monroe Diagnostic Tests in Arithmetic and the computation test of the Stanford Achievement Test to 83 and 140 freshmen, respectively, found that from one-sixth to one-third failed to attain the standard for grade eight. Guiler (144) found that 22 teachers of arithmetic in his summer school classes attained median scores on the Guiler-Christofferson Diagnostic Survey Test in Computational Arithmetic—slightly less than that usually attained by college sophomores. Lueck (155), in giving the Compass Survey Test in Arithmetic to 280 students in first-year physics in five Iowa colleges,

found that the mean score approximated the standard for the low-seventh grade. Lueck (154), in another report, showed that the most frequent errors made by these students are: changing percents to decimals, dividing a proper fraction by a decimal, and dividing a mixed number by a mixed number. In general, these studies show difficulties in examples involving fractions, decimals, and denominate numbers. Cooke and Fields (131) decided on the basis of results obtained from the administration of a battery of mental tests and tests in arithmetic, algebra, and geometry to 150 pupils in high school taking beginning algebra or geometry, that the facts did not warrant recommending a review of arithmetic before proceeding to other courses, although they suggested such a review might be helpful before attempting algebra.

Problem Solving

Problem analysis—Three studies are concerned with the process involved in the solution of verbal problems. Mitchell (163), working with 117 pupils in grades seven and eight on the problem of the extent to which the analysis of problems aids in their solution, found that accompanying lists of verbal problems with analytical questions helped materially in the children's ability to solve the problems correctly. Adams (106), using 1,938 pupils in the experimental classes in which detailed analysis of the steps in the solution of verbal problems was emphasized, and 1,836 pupils in the control group in which the same problems without the analysis of the steps involved in the solution, found no differences in the results obtained in grade 4A, but found superior results in the experimental classes in grades 3A and B. He concluded that greatest gain from specific instruction in problem solving was in the grades in which problem solving is just beginning. Hanna (145), working with three groups comprising 477 pupils in grades four and seven, attempted to determine which of these methods would result in greatest gains in problem solving: (a) dependencies method, "to find the answer I must know this," etc.; (b) the conventional formula method, "what is called for"; (c) individual method, "any method the pupil desires to use." The results from his carefully controlled investigation showed the conventional formula method produced less mean gain than the other two methods. The results obtained from the dependencies and the individual methods were approximately the same. The dependencies method was especially effective with pupils of low mentality.

Influence of reading on solution of verbal problems—Three studies concerning the relationship of reading to achievement in the solution of verbal problems are reported. Stretch (189), working with a group of control and experimental pupils consisting of 32 pupils, each, in grade five, equated on the basis of reasoning in arithmetic, comprehension in reading, and general intelligence, found as a result of stressing problem solving in the experimental group that it made greater gains than the control group on both the arithmetic and reading tests. She concluded that there is a positive relation-

ship between achievement in reading and problem solving, and that the two abilities increase together. Monroe and Engelhart (164) found no significant differences in the results obtained in thirteen classes in grade five in which reading of verbal problems was stressed, and in equated classes in which reading of verbal problems was not emphasized. They concluded that difficulties attendant upon use of experimental method rendered results uncertain. Engelhart (134), in studying the relative contribution of certain factors to individual differences in problem solving, concluded that intelligence and computational ability are important factors in causing individual differences in problem solving, but the effect of general reading ability is practically negligible. Engelhart's study is unique in that he uses the path-coefficient technic. His study involved results from 568 pupils in grade five, but his results are at variance with a number of existing studies on the relationship of achievement in reading and in the solution of verbal problems.

Factors contributing to ability to solve verbal problems—Engelhart (134), in the study just referred to, reported that ability in computation and intelligence are largely responsible for the variation in the ability to solve verbal problems. Stevens (186), upon the basis of analysis of results of achievement and mental tests from 3,089 pupils in grades three to seven by means of zero, first, and second order correlations, found that ability in the fundamental operations is more closely related to achievement in solving verbal problems than is general achievement in reading. He found, however, that results from tests in problem reading had higher correlation with results from tests in problem solving than with tests from general reading or from fundamentals in arithmetic. Neulen (165) reported the correlation between problem solving and skill in fundamental operations was considerably higher than between problem solving and general intelligence.

Miscellaneous factors influencing problem solving—Robertson (177), after testing 712 pupils in grades four to seven on two sets of verbal problems of equal difficulty, one read aloud to the pupils by the teacher and the other read silently by the pupils, discovered much higher scores on the pupil-read tests. He argued the need for practice on problems presented orally since most problems encountered in life are oral. Rosse (180), after a fifty-eight-day investigation in which practice was given by means of Lennes Test and Practice Sheets in Arithmetic, concluded that these materials are valuable in improving the ability to reason in the solution of verbal problems. Rolker (178) described a supervisory program for improvement in problem solving and presented facts to show that the pupils made real gains as a result of the program.

Selection and Arrangement of Subjectmatter

Sueltz (190) analyzed the front pages in thirty-five copies of fourteen different publications to determine the knowledge of number requisite for efficient reading. He found the total number occurring to be 3,917, with 497 different uses. Decimals with 81 different uses were employed 118 times.

Sixty-four fractions and mixed numbers were used. In general, most of his numbers were small but they ranged from .01 to 10,000,000,000. Woody (200), in his analysis of the knowledge of arithmetic needed for reading the material read in the elementary school, found in addition to his long list of arithmetical concepts and his list of commonly used simple arithmetical numbers, fractions, measures, and symbols, quite a list of rarely used fractions with large denominators, and of many less frequently used symbols and units of measurements. He concluded that the reader's knowledge of arithmetic should be much more extensive than that needed for mere calculation in the problems of everyday life.

Changes in content of textbooks—Gorman (139) analyzed the textbooks in arithmetic published in the periods: 1907-10, 1917-20, and 1927-30. In determining trends, he considered a practice typical if he found it present in 50 percent of the books published in a given period. He found three important changes: (a) from the abstract to verbal problems within the understanding of the pupils; (b) from the deductive to the inductive method with the employment of simpler language; and (c) more attention to types and classes included under general uses. He also noted a tendency in the more recent books for providing inventory, diagnostic, and progress tests, and for accompanying remedial drill. Metter (162) analyzed 55 texts representing three periods: 1860-92, 1893-1914, and 1915-33, and listed the tendencies somewhat in line with those enumerated by Gorman. Metter makes this outstanding statement: "The lists of topics recommended for elimination or for less emphasis after 1900 included a number of topics which had already disappeared, some of which were given only minor place and others which had never been given much attention and hence were an insignificant portion of the arithmetic curriculum at all times."

Difficulty of arithmetical processes—Ruch (181), in reviewing a number of studies dealing with the relative difficulty of the 100 multiplication facts, presented four observations: (a) learning difficulties are very different from final difficulties; (b) there is a rough agreement of the order of difficulties in learning in two of the studies; (c) there is considerable correlation of difficulty and size of the product; and (d) the so-called zero difficulties rise from neglect and disappear with practice under controlled instruction. He argued that these facts should be taken into consideration in constructing materials of instruction. Brueckner and Laumann (118) reported a study in which they tried to measure the reliability of judgments of ratings of a group of problems of known difficulty arranged in random order on the basis of a problem scale containing arithmetic problems of known value. They concluded that "it is doubtful whether the tedious process of testing children to determine the difficulty of problems is more reliable than the technic of having reliable judges estimate the difficulty of problems by means of a scale consisting of problems of known difficulty." If further investigation should substantiate this conclusion, the conclusion reached will be of great value to those engaged in test construction or in the preparation

of materials of instruction. Brueckner and Irving (121) reported a technic for comparing the difficulty of problems in textbooks. They selected 30 problems at random from each of 10 textbooks for grade five and administered them to 100 pupils in grade five. They found that the median percents of correct solutions for the various books ranged from 30 to 54. They stated that textbook committees can easily use the technic developed.

Nature of content of textbooks—Entz (135) analyzed 16 three-book series for grades seven, eight, and nine for practice exercises in securing and maintaining computing skills in the fundamental operations. He found all books for grade seven made definite provision, ranging from 382 to 2,266 examples. Two books for grade eight made no provision; one had only about 100 examples; but the book with the highest amount of practice provided 2,323 examples. In grade nine only three books made any serious provision for practice to maintain skill in the fundamental operations. Distad (132) analyzed ten texts published between 1925 and 1930 to find the extent of abstract drill provided in division of decimals. He found 4 general types and 61 specific types of examples. No series provided drill in more than 51 of the 61 specific types; 18 types are almost entirely neglected in over one-half of the books; and the most difficult type, i.e., the integer divided by a decimal, receives the least amount of practice. The facts revealed are interesting, but whether or not they are significant may depend on the method of teaching as indicated by the results given in the section on transfer of training. Neulen (165) analyzed 24 courses of study to determine the amount of practice provided in grade placement of problems of one, two, three, and four steps and then to determine the ability of the pupils in grades three to seven to solve such problems. He discovered from the courses of study that the placement of the one-step problems ranged from grades one to four; of the two-step problems, from grades two to five. He stated that "there appears to be no close agreement among the outstanding courses of study with respect to the grade placement of problems that involve one or more reasoning steps." He found on testing the average mastery on all problems in all grades was only 34.1 percent; that in grades two and four, 60 percent mastery was attained only on two-step problems.

Evaluation of two types of drill materials—Kulp (153) described in detail experimental procedure for evaluating two types of practice material for developing skill in computation. The investigation involved 142 pupils in grade four. One set of drill materials was planned for use in grade four; the second set, partly for use in grade two and partly for use in grade four. The second set of materials produced superior results. Better results were obtained with the material designed for grade four than that designed for grade two.

Vocabulary Studies

Three significant vocabulary studies were made during the period under consideration. Pressey and Elam (174) selected 117 words as a core vocabu-

lary absolutely essential in the study of arithmetic in the elementary school. These words were selected from four previous vocabulary studies on the basis of three criteria: (a) occurrence in the highest third in frequency in at least two of the studies; (b) rating as essential by at least half of a jury of 100 elementary-school teachers; and (c) general social value as determined by studies of uses in business, science, etc. Pressey and Moore (175), previous to the determination of the above list, had given a list of fundamental words to from 406 to 643 pupils in each grade from three to twelve and found an inadequate mastery of terminology. They suggested that lack of mastery of vocabulary is one of the most important reasons for the difficulty encountered by persons of all ages and social strata in dealing with anything of a mathematical nature. Buswell and John (124) presented a series of studies dealing with the nature and development of concepts of technical and semi-technical terms in the arithmetic of the first six grades. Among the investigations reported are: giving of group tests on the understanding of 100 arithmetical terms to 1,500 children in grades four to six; the giving of individual tests embodying 33 arithmetical words and phrases to 240 children in grades one to six; and a study of the initial explanations of a selected list of words in ten textbooks. They presented data showing enormous variation among pupils in their knowledge of the vocabulary of arithmetic. In some grades and school systems the growth in understanding of vocabulary is meager; in other grades and systems the growth is as much as 60.2 percent. Misconceptions of some terms do not decrease materially from grade four to grade six. They also found that the lack of adequate explanation of new terms and adequate drill for fixing meaning intimated these facts may be attributed to lack of growth in vocabulary on the part of the pupils. The study by Woody (200) represents an effort to determine what arithmetic vocabulary is needed for understanding and appreciating the ordinary reading which children in other elementary schools are asked to do. His study consists in analyzing 13,298 pages of reading material contained in 38 textbooks and 9 issues of magazines written for juvenile readers. His study gives a list of mathematical terms encountered and provides comparisons with other well-known lists.

Sex Differences

Only a few studies made mention of sex differences in achievement in arithmetic. MacLatchy and Buckingham reported in the *Twenty-Ninth Yearbook of the National Society for the Study of Education*, published previous to the period under consideration, no important sex differences in the results of their investigation on the knowledge of arithmetic possessed by six-year-olds. Woody (199), on the other hand, in his much more extensive investigation, found on almost all of the 204 items of his tests that a higher percent of the boys than of the girls responded correctly. He found greater differences on the harder items of the tests. The differences between the responses are rarely three times the standard error, but there is a constant tendency for

the boys to be superior to the girls. He ventured to explain these differences in terms of the wider social environment of the boys and hence of greater familiarity with the type of arithmetic situations presented. He suggested that possibly the greater interest of boys than girls in later life in mathematics is conditioned by early experiences with number relationships. Dunlap (133) in studying race differences in the schools of Honolulu found no sex differences in the pupils in grades three to eight on the computation test, but that the males exceeded the females in arithmetical reasoning. Schmidberger (183), in studying the responses of 2,284 pupils in grades three to eight, to four series of problems, discovered in general no sex differences in central tendencies or dispersions; but, if the problems were weighted according to difficulty, the achievement of the boys was superior to that of the girls. The superiority of the boys was apparent for the most difficult problems. Clem and Hovey (128) found girls from village schools made higher scores than the boys from such schools, but in the rural schools the achievement of the boys was superior to that of the girls. F. J. Brown (114) found that knowledge of results achieved each day for a twenty-day drill period was a greater stimulus to the boys than to the girls. These studies may suggest the need for additional investigation of sex as a factor in the mastery of a subject like arithmetic. Adult psychology may show no significant differences in the achievement of the sexes at maturity, but that fact does not mean the non-existence of sex differences in the various stages of mental growth and maturity.

Miscellaneous Studies

Mention will be made of a few studies that seem to defy classification. Barthelmess and Boyer (109), in an effort to evaluate ability grouping, reported statistically significant differences in arithmetic in favor of homogeneously grouped as opposed to heterogeneously grouped pupils. Hollingsworth, Lacey, and Shannon (148), in submitting an inquiry to 569 teachers in Indiana, found that arithmetic was the second easiest subject to teach. The most common reasons offered were: adequate textbooks, well-organized courses of study, and thorough training in methods of teaching. Stokes (187), in comparing the effects of arithmetic and general mathematics training in grades seven and eight upon achievement in general mathematics in grade nine, found that those studying general mathematics in the early grades made higher scores on the Reeve General Mathematics Composite Scale. Carter (127), in studying family resemblances in verbal and numerical abilities, administered the Courtis Standard Research Tests in Arithmetic, Series B, to 108 families (215 parents and 230 children). Among his findings are the following: (a) a decline in ability with increasing age on the part of the husbands; (b) negative correlation with years of education for both fathers and mothers; (c) no significant sex difference among children; (d) superiority of the male adults to the female adults in arithmetic; and (e) no resemblance between husbands and wives in achievement in

arithmetic. This study is important in that it emphasizes the study of hereditary influences on achievement. Merry (161) reported a survey of the achievement of 170 blind pupils in grades three to six. He found that these blind children made favorable comparison in scores on the Stevenson Arithmetic Reading Test. He said that blind children could ascertain what is to be found and the processes necessary for a solution, but that they needed instruction in enumerating the facts given and in estimating answers. Clem and Hovey (128), in comparing the achievements of 193 pupils from village schools with 196 pupils from rural schools, found the former had higher mean scores in arithmetic than the latter. Stokes and Finch (188), in comparing the norms of certain standard tests in arithmetic, gave five different tests to 65 pupils in grades seven to nine at the University of Minnesota High School. They found significant differences between the average grade levels by pairs of tests. The New Stanford Achievement Test has grade-level standards: .77 grade above those for the Van Wagenen Revision of the Woody Arithmetic Scales, and .74 grade above those for the Buckingham Scale for Problems in Arithmetic. Such discrepancies probably result from variations in the groups on which grade levels were determined and in the parts of the school year at which the grade levels were established. Dunlap (133), in studying race differences in the schools of Honolulu, discovered that Chinese, Korean, and Japanese pupils did better in arithmetic than the part Hawaiian, Filipino, and Portuguese pupils.

CHAPTER III

Character Education

The Field and Methods of Attack

CHARACTER education has only recently been opened up for experimental study, one of the pioneer objective experiments being that of Voelker only fourteen years ago. But since the time of his study, and especially since 1930, the development has been very rapid. What character education really is and what its objectives are have not yet been fully agreed upon. It is perhaps too early to set up even tentative boundary lines, but for the purposes of this review it will be necessary to define what we are reviewing and exclude certain topics. Among the studies not included are those on interests, emotional and temperamental maladjustments, psychopathic and psychotic conditions, health, educational and vocational guidance, and the development of tests which have been adequately covered in other reviews (219, 224, 227, 234, 239, 240, 242). Also, curriculum studies and specific plans for activity programs, as well as studies of character development in summer camps, clubs, churches, etc., have been excluded unless principles have been evolved which have rather general application or significance.

Probably there will be little criticism of these exclusions for practical purposes of this review, though the very mention of them indicates that they are not without interest to the student who would consider character education in its wider ramifications. Indeed it should be said that in the broadest sense all the work of the school, the home, the church, and other organizations which assists the individual to adjust his behavior to the demands of social living, is character education. In the school situation certainly all the work along such lines as educational guidance and classification, diagnostic testing and remedial teaching, mental and physical health, and the work in the socialization of the individual make contributions to character development. But since character development is more of a concomitant and not a primary aim of such work, it seems justifiable to exclude from this review any discussion of the contributions from these neighboring fields.

There are three other lines of work, however, about which decision is more difficult: first, the work on characterology; second, that involving clinical study and adjustment; and third, that involving the broadside attack on political, economic, and social beliefs. The work in characterology lays chief emphasis on the all-round study of the individual and the identification of types. Its main value to date has been its contribution to theory. To the clinical worker and to the test-builder who is concerned about the psychological and psychiatrical theory of what he is testing, this contribution is valuable. But due to the limited application which has been made of this

work to education, we shall not include a review of it, but merely refer to a few representative discussions (203, 222, 246). For further references and a brief summary the reader is referred to Maller's review (226) of the German literature, where practically all the most important contributions to characterology have appeared.

The work in the clinical field, like that in characterology, is concerned with the intensive study of the individual, but it has a definitely educational bent in that it is always concerned ultimately with adjustment. Probably the teacher has much to learn from developments in this field, especially in methods of dealing with unusual cases, but ordinarily the clinician is not interested in evolving principles or methods which can be applied by teachers, and it is difficult to arrive at any generalizations to report here. There is one attitude often expressed or implied, however, in the reports and discussions from the clinical field which probably should be mentioned, namely, that the best method of character education is one of preventing or reducing the moral and emotional conflicts of the individual. For example, if fear of punishment and the desire to surpass another child in school act as motivation for lying or cheating, then the removal of the fear of punishment and the competition motive in school is the job for character education, not the attack on lying or cheating itself (217). Though the application of this point of view may seem difficult or impossible in most school situations, the appreciation of it may at least serve to assist educators to understand better some of the recommendations of psychiatrists and other clinical workers in the case of individual problem children, and certainly some teachers would do well to attempt to apply it in not overmotivating children by fear, in not placing too much stress on competition, and in not creating conflicts by ignoring the ideals which children have.

The third line of attack mentioned above, namely, that involving education on economic and social questions, will certainly be considered by some readers to be one of the major procedures in character development. A good illustration of this method is given in a study by Biddle (205). He prepared nine lessons designed to teach children to be open-minded and non-gullible to propaganda about questions involving attitudes toward international, industrial, economic, and racial problems. He arranged an equivalent-group experiment consisting of one trained group and one control. After a training period lasting several weeks he found that 73 percent of the children of the experimental group showed improvement according to his criterion. He says, however, in discussing the reactions of the children that early in the experiment some of the pupils questioned whether his lessons were not pacifistic, socialistic, and pro-German propaganda. Another program in which adult problems are attacked broadside in the teaching of children is described in a book on character education in Soviet Russia (237). This book is a translation of the specific directions issued by the educational authorities of the Soviet government for use in training Young Pioneers. "Whom shall we educate?" the book (237: 31-32) asks. "Briefly

we shall educate Communists, but what does this mean? . . . To train up a Communist means to train up a collectivist, an internationalist, and a militant atheist. . . . The child should be shown the roots of egotism, individualism, and private property, the evils against which we are contending. . . ." The mention of the study by Biddle and the book on Russia may seem to be the selection of extreme cases [1]—and perhaps it is—but these two books serve to bring out clearly questions which are in the minds of many with regard to the objectives and methods in character education. Pierce (231) raised the question whether vital character education can be given without running into conflict with the prevailing mores of adult society, and whether anything can be taught in the public schools which does seriously run into such conflict.

There is one other line of attack on the character education problem, and it is with this that the rest of the review will be concerned. This attack deals with ways and means of improving children's character in connection with situations which they, as individuals and groups, meet in their daily living. This is, in general, the approach which is stressed in the Department of Superintendence Yearbook (228) on character education prepared by Freeman, Counts, Watson, Threlkeld, and others. The general method here is not one of an attack on existing institutions or adult mores, but one of teaching the child individually and in conjunction with others to practice with satisfaction in each character situation those responses which, if generalized and practiced universally, would best meet the demands of the situation for all concerned.

Following this line of procedure many experimental studies have been made on children's learning in various concrete situations, and from such studies have developed an appreciable number of facts and stimulating observations concerning methods of teaching.

Classroom Methods

General—The studies on methods in character education can be classified into two groups: first, those dealing with methods in classroom instruction, and, second, those dealing with methods involved in athletics, school discipline, informal contacts between teacher and pupil, etc. This section will be devoted to studies of the first type. Peters (230) said that the sources of character growth are social pressure, personal experience, and vicarious experience, and concluded that the province of the school is primarily one of providing this vicarious experience. Jones (221) classified the methods which have been proposed for use in classrooms as follows: direct attack through use of precepts, codes, etc.; ratings (teacher's marks and self-ratings); incidental training through regular school subjects; discussions; first-hand experiencing; and discussions coupled with first-hand experiencing. Heaton (216) gave the most complete collection of methods and mate-

[1] Several other studies—all showing that attitudes can be changed at least temporarily—might be mentioned, though the most important of these deal with students of the college level.

rials that has appeared. Freeman (211) gave a penetrating discussion of character education from the point of view of psychology.

Incidental training—The claim has been frequently made by educators that the best method of providing for character development is through incidental work in connection with the regular school subjects, no special attention to character education being necessary. Hartshorne and May (214), however, as a result of their extensive study emphasized the great difficulty of making changes in the character of children. They do not recommend any special period for character education—far from it—but they do make it clear that anyone hoping to achieve character outcomes from instruction will have to work for them and not expect them to come incidentally. Peters (229), in 1930, expressed the belief that history and geography offered excellent opportunities for incidental training in character; but three years later a study conducted under his supervision by Kniss, Robb, and Glatfelter (223) under actual schoolroom conditions showed that incidental instruction was "ineffectual in improving moral judgment and in furthering moral conduct." Sinclair and Tolman (233) found that instruction in science and mathematics did not lead to any decrease in prejudice or illogical thinking on citizenship or character questions.

Discussion method—The discussion method is one in which an attempt is made to improve attitudes and conduct by studying and talking about them. Many investigations have been made concerning the efficiency of this method, but the evidence is conflicting, particularly that dealing with the value of the method for improving actual conduct. Hartshorne and May (214) reported an experiment involving discussions of honesty. The instruction did not prove to be of any value in reducing dishonesty as measured by several conduct tests. In attempting to teach cooperation, however, these same experimenters found the method to yield some positive results. In Thompson's extensive study (236) he noted that a limited use of the discussion method led to improvement in honesty, but that, after a certain number of discussion periods, retrogression could be noticed. He found, for example, that children having 40 discussion periods improved appreciably less than those having 20. When applied to the teaching of attitudes and opinions, the discussion method is usually found to yield positive results, at least as judged by paper and pencil responses of the children taught. This was shown by the study of Campbell and Stover (207) on attitudes toward certain national groups and toward war; by that of Cherrington and Miller (208) on pacifism; and that of Robb and Faust (232) on ethical discrimination. The obvious question concerning all results involving changes in opinions and knowledge is the degree to which improvement in opinions and knowledge has any counterpart in improved conduct.

First-hand experiencing or project method—In contrast to the discussion method where emphasis is upon meeting character situations vicariously by talking about them, the project or activity method places the emphasis upon doing. A stimulating, non-experimental discussion of the possibilities of this method has been prepared by Bower (206).

In spite of the high favor in which this method is held by many educators, there has been little experimental work done to determine whether it is the activity alone or the activity plus discussion which really should be recommended. There is one study to report. Jones (220) has prepared a brief abstract of a lengthy study, not yet published, in which the first-hand experiencing method, the discussion method, and a combination method composed of both are compared. He found that experiencing without discussion and generalization often seems to be no better than discussion without first-hand experiencing. Doubtless the advocates of the activity method mean to include discussions along with activities, but often they fail to emphasize this fact. This study serves to stress the necessity of considering meanings and generalizations in all learning which is to have any transfer effects, and holds out the warning that if thought and discussion are omitted from activity programs in character education there is danger that they will eventuate in mere *doing* rather than in real educational *experiencing*.

Combination method—activity plus discussion—This method seems theoretically to be the most satisfactory one for general classroom use. It incorporates the principle of learning by doing and at the same time applies the transfer-of-training principle that whatever is to transfer must be "raised to the level of consciousness." It avoids the empty discussion of traits and the attendant danger, so properly condemned by the Department of Superintendence Yearbook (228:46), of leading children to become character-conscious or self-righteous. It is to be regretted that there is not more experimental evidence concerning the value of this method, but what is available is definitely in support of it. Collamore and Jones (210) reported in some detail a project in trusteeship in which the combined method was used, and from the description of the children's reactions during the unit it appears that improvements in moral behavior must have been taking place, though no quantitative results are given. In Jones' study (220) referred to above it was found that the activity-plus-discussion method was superior to activity or discussion taken singly. Zyve (247) has found that specific practice of honesty in scoring test papers when supplemented by discussions led to appreciable decrease in cheating in situations closely similar to those in which the training took place. She stressed the importance of specific practice and specific discussion as contrasted with non-specific practice and discussion.

Studies Bearing on Non-Classroom Methods

In addition to the possibilities for character education through planned instruction in the classroom there are also opportunities offered through athletics, through various group activities of the school, through cooperation with non-school agencies, and through the intangible force of the teacher's personality and character. With regard to athletics, the Department of Superintendence Yearbook (228) stressed the opportunities offered

there for guidance in group loyalty, teamwork, and good sportsmanship. Sufficient attention, however, is not given to the win-at-any-cost attitude which dominates the methods of many coaches and physical directors. It is to be regretted that few experimental studies have been made to determine the actual character gains attending athletic programs. Clevett (209) obtained results in connection with physical education activities which indicate that if special effort is made, improvement in character can be achieved through such activities. Hackenberg, Yeich, and Weisenfluh (213), however, compared the athletes and non-athletes of three schools in certain character traits to which presumably athletics should have made some contribution, and in only one of the schools did they find the athletes to surpass the non-athletes.

The opportunities for character education through club activities both in and out of school are well presented in the Department of Superintendence Yearbook (228). Specific methods which have been employed in various cities for cooperation between the school and Scouts, Boys' Clubs of America, Camp Fire Girls, Junior Red Cross, etc., are described. Ways in which the school may cooperate with the home, the church, the child guidance clinic, and other agencies concerned with character education of children are worthy of much study.

There are many studies, however, showing the limitation of all work in character education if the cooperation of the home is not obtained. Work in the prevention and cure of delinquency and that in sex education are particularly contingent upon the favorable attitude and active cooperation of the home. Indeed with regard to sex education the Department of Superintendence Yearbook (228) took the position that though the schools can do something through the regular curriculum and through individual counseling, "many school systems will make their most significant approach through parent education." The following are a few of the significant studies and discussions emphasizing the necessity of considering the cooperation of the home in any plan of character education: Berk, Lane, and Tandy (204), Germane (212), Watson (241), and Williams (244). Witmer (245), however, showed the difficulty of making changes in parents' attitudes and methods by a parent-education program in sex education.

The last and most important factor of the school to be mentioned in connection with character education is the teacher. Wickman (243) showed that teachers differ greatly in their ability to distinguish between the trivial and the serious in misconduct, and also differ in their ability to see opportunities for character education with individuals and groups. Healy and Bronner (215) said that teachers' dislikes and prejudices help determine children's attitudes and behavior. From these and similar reports it appears that the most important single element in planning work in character education is the selection of teachers who are well adjusted, natively gifted, and well trained. Even with the best of programs and best of methods there will be between the superior and the inferior teacher a vast difference in the power to influence child conduct.

CHAPTER IV

English Language

THIS review of research in English at the elementary-school level summarizes the available objective evidence not covered in previous issues of the *Review of Educational Research,* with particular emphasis on the period from January 1, 1931 to July 1, 1934. Following the comprehensive summary of studies in language, grammar, and composition prepared by Lyman in 1928 a number of useful résumés of research in the field of English have been made available. In addition to those mentioned in Volume I of the *Review of Educational Research* (321, 366), there are three summaries which deserve mention. The National Conference on Research in Elementary School English (285) presented the results of a research program in a single institutional center. Through the same organization, Guiler and Betts (288) presented in 1934 a summary of thirty-five important research studies in elementary-school language. The Research Committee of the National Council of Teachers of English has also prepared a résumé and bibliography of research contributions to the teaching and curriculum making in English which have appeared in published form during the first six months of the current year. This summary is to appear in forthcoming issues of the *English Journal.*

The results presented in these summaries represent significant evidence of the rapidly increasing interest in research in language. The recent appointment last year of a Committee on Research by the National Council of Teachers of English and the organization of the National Conference on Research in Elementary School English are most encouraging signs of the increased consideration now being given to objective methods and evidence by those most interested in the improvement of instruction in English.

Research Technics

Two important types of research technics in English deserving mention have been developed during the period covered by this review. Betts (258) developed and evaluated apparatus for the electrical recording of oral language activities under experimental and classroom conditions. Under the conditions set up in this experiment the electrical recording apparatus proved to be distinctly superior to all other forms of recording such as court reporters, shorthand reporters, longhand reporters, and phoneticians. Experience with this apparatus indicates that it opens up great possibilities for curriculum investigation in language. Goldsmith (281), Goltry (282), Kiefer (314), Laughlin (319), and Nixon (328) used this equipment in securing extensive samplings of pupils' oral language activities at various

grade levels. The apparatus which has been much refined is now in use in an extensive research program in oral language.

The mechanical analysis of oral and written language by means of Hollerith machine equipment has been successfully undertaken by Goltry (282). Goltry's study, at present incomplete, involves the analysis of over 100,000 running words of free oral language of pupils in grades four, five, and six. The transcriptions of the oral recordings of these samplings have been transferred in small units to Hollerith machine cards and by means of a system of coding the significant usages are identified. Coded samplings of oral and written language usages covering the entire grade range amounting to approximately one million running words are now ready for analysis.[1]

Content and Placement of the Curriculum

Research in the English curriculum is definitely influenced by the psychology and philosophy underlying language instruction. The objectives of the teaching of language, composition, and grammar have been precisely summarized in the report on English in the National Survey of Secondary Education. In this report D. V. Smith (348) revealed startling evidence indicating that English teachers are far too much occupied with the mechanical and technical aspects of language. Greater need for emphasis on oral language has been presented by Lyman (326) and others. Starbird, Williams, and Hatfield (354), in a report of the Research Committee of the Greater Chicago English Club showed that only one out of twenty-nine social demands on language ability was of the written type.

Studies in the content and placement of instructional units in the language curriculum approach the problem from a number of different points of view. Hays (303) analyzed seven series of elementary English textbooks for the purpose of determining the mechanical and usage skills receiving emphasis, and the grade location of each. R. A. Bailey (252) checked three ninth-grade English texts and found that far too much emphasis was given to instruction on mechanics and not enough to oral language and the ability to express ideas clearly. Lien (324) checked the amount of drill on adjectives, the number of different adjectives receiving emphasis, the grade placement, the presence of supplementary drill, and the social importance of the adjectives used in six modern elementary language textbooks. Van Brussel (362) made a similar study of verbs not previously reported.

As a basis for the more exact allocation of language skills in the lower elementary grades, Brainard (262) and Friest (277) attempted to identity pre-third-grade skills. Brainard asked superior first- and second-grade teachers in five hundred schools in the forty-eight states to check: (a) the skills taught because required by textbook or course of study; (b) the skills taught without regard to requirements; and (c) skills which they expected a child to know on entering the grade. Friest checked courses of study, textbooks, and workbooks with a similar purpose in mind. The

[1] A study by H. A. Greene, University of Iowa. Incomplete and unpublished.

results of the two studies reveal a surprisingly large list of pre-third-grade language skills.

In keeping with the more modern concept of social usage as the basis for the curriculum, the analysis of the writings of children and adults naturally affords the most effective source. C. H. Bailey (251) analyzed the written compositions of 1,150 pupils in grades four, five, and six for verb forms and verb errors. The error frequencies and quotients for these verb forms afford a very useful source of drill material. Holtman (305) cross-checked pupil usages of pronouns in their compositions with instruction given on these items in textbooks. Frogner (279) analyzed the punctuation of approximately 1,000 pupils in grades seven, nine, and eleven for evidence on practical aspects of the teaching of sentence structure.

Nice (327) studied the development of sentence sense in children from sixteen to forty-three months. Hoppes (306, 307) reported significant growth in written expression of elementary-school children in grades three, four, five, and six in respect to mastery of gross elements of sentence structure and apprehension of word meaning. Seegars (344) found a definite relationship between the form of the discourse and the complexity of sentence structure used.

Test results have been critically analyzed by Guiler (289, 295) and by Lawrence (320) to secure a basis for the more efficient correction of persisting errors in usage. Guiler (289) tabulated the difficulties in the use of verb forms in the Guiler-Henry test encountered by 625 college freshmen. Tests papers of 38,529 Ohio school children in grades three to six were also analyzed by Guiler (295) to reveal the prevalent types of errors. Lawrence (320) gave an informal test of fifty sentences in multiple choice form to one hundred eighth-grade students in English classes. Boys consistently made many more errors than girls. A useful frequency list of the fifty errors used in the study was reported.

La Brant (317) showed certain characteristic language developments in children in grades four to twelve by analyzing approximately 1,000 compositions. Bardwell (253) reported the results of a survey of pupils in all elementary schools in Madison, Wisconsin, showing a useful list of language faults with their frequencies. Pease (333) analyzed 480 compositions written in school by pupils of grades seven to twelve for the purpose of revealing grammar usages and errors in these grades. Landsdowne (318), in attempting to find a remedy for unsatisfactory results in grammar teaching, studied the grade placement of the elements of formal grammar in twenty-five public school systems. Crowding and inconsistency were apparent throughout. The thorough teaching of a few items of formal grammar related to usage chiefly through the sentence comprises the major recommendation of the study. Current researches dealing with the selection and grade placement of grammar items were analyzed by J. P. Leonard (322). A definite allocation of functional grammar items is presented for each of the four high-school years.

Klein (315) found that fifth-grade students whose intelligence is high tend to use specific, vivid, and accurate adjectives. Benzler (257) analyzed the compositions of fourth- and fifth-grade pupils to reveal differences in the mastery of certain punctuation skills by high and low I.Q. groups. A similar study by Vanderstoep (363) was carried on in the sixth grade. Significant differences in the error quotients for the two groups are reported in both studies.

Oral language activities have been recorded and analyzed by Goltry (282), Goldsmith (281), Laughlin (319), and Nixon (328). The last three studies deal with the oral language usage of children in the primary grades, and present evidence on pupil mastery of modifiers, verbs, and sentence structure. Kiefer (314) made a significant contribution through the electrical recording and analysis of oral summaries representing a year's work in a first grade. Kiesling's study, now in progress at the University of Iowa, analyzed these same data in an attempt to reveal objectively certain characteristics accounting for high and low quality in oral compositions.

The relation of oral and written language activities has been shown objectively by three studies based upon the same data collected by means of the electrical recording equipment. Gregerson (286) showed relatively low correlations for the quality of oral and written compositions prepared by the same individuals. However, there was the expected superiority of the written composition over the oral in each class in which the study was made. Jakeman (309) analyzed the same transcripts for differences in oral and written vocabulary forms. White (365) further refined the data to reveal differences in the semantic variations in vocabulary used in written and oral compositions.

Objective evidence on the grade placement of language items is very limited, and such as is available is indirect. Cockerill (265), B. N. Hamilton (298), and F. N. Hamilton (299) carried through studies of pupil usage of certain punctuation items in grades five, seven, and nine as factors in grade placement. These studies were based upon the same data used by Cesander (264) in grades four, six, and eight. Other indirect evidence of some assistance in determining grade placement is that prepared by Gettys (280) and Kennedy (313). The former study deals with persistence of error in certain of the basic punctuation usages while the latter deals in a similar way with persistence of error in pupils' reactions to certain common verb forms. O'Rourke (330), in a summary of evidence collected in connection with a nationwide survey of language usage, presented a real challenge to teachers of English. Slight positive increases in mastery of certain common usages were revealed from grade to grade. On the other hand, many simple usages failed to show mastery even at the end of the senior year of high school.

Difficulties in the establishment of standards or criteria of usage have seriously handicapped curriculum construction in language. S. A. Leonard's

monograph (323) brought together a large amount of evidence on certain current usages. Pooley (335) revealed many of the discrepancies in grammatical rules on the one hand and conventional usages on the other as they have come down through a century of language growth. Barnes (255), working with a committee of students, showed most interesting evidence on certain disputable items in the Leonard monograph as checked against such authorities as Fowler and Krapp. Over 400 slang terms were also rated for 100 men and women. This study also reported the results of checking twenty-two standarized tests in English for the presence of disputable items appearing in the Leonard monograph. The judgment of 121 radio announcers and officials was also secured on the selected usages. In general, radio announcers and executives were found to be conservative, while eminent linguists were much more liberal in their approval of questionable usages. More than one-third of the slang expressions were considered as acceptable. Standardized tests were found to be very conservative in their willingness to discard commonly accepted errors.

Greene (283) proposed as a criterion of correctness in certain mechanical abilities in written language the frequencies with which each specified usage is mentioned in seven manuals of style used by twenty-six publishing houses. Obviously such a criterion has many limitations. Betts (259) presented further evidence on the utility and limitations of this procedure. Njus (329) prepared a similar type of standard of correct language usages by cross-checking ten handbooks and style manuals on usage and diction. Bontrager (260) made an analysis of the criterion proposed by Greene showing the vocabulary content, the main ideas involved, and the precise variations in the important punctuation situations presented. Four hundred eighty-four specific variations of punctuation skills were identified of which forty-four were tested objectively for mastery. This study showed the need for a much more complete check of the various language skills as used by pupils and by adults if we are to discover which variations of skills actually carry the load in social usage.

Evaluation of Method

Warner and Guiler (364), using 360 ninth- and tenth-grade pupils arranged in three equal groups, conducted an experimental evaluation of individual instruction versus group instruction. This experiment extended over a period of twelve class periods of fifty-five minutes each. The results indicate that individual instruction based on individual diagnosis is much more effective than mass instruction in the correction of shortcomings in grammatical usage. Allen and Murphy (248) proposed a practical combination of the individual and group methods of instruction. Experimental evidence supporting the plan is not presented, although specific claims are made for the efficiency of the plan.

The effect on accomplishment in English of varying the length of a study period was investigated by Boynton and Barnard (261) in a ninth-grade

class of twenty students. While the population used in the investigation was doubtless inadequate, the evidence nevertheless raises some question as to the efficiency of the shorter study period which is quite commonly accepted. The problem of establishing the optimum length of study period under classroom conditions seems to have been reopened by this study. Dalthorp (268) found little or no difference in the efficiency of instruction resulting from teaching English to twelfth-grade students in groups of eleven and of thirty-nine. While the smaller group naturally received more individual attention, there was greater stimulation for the teacher in the larger group resulting in more alertness on the part of the pupils.

Hatfield (301) compared the results of dogmatic and inductive procedures in the teaching of rules and general principles to a seventh-grade class. Two classes were studied, one being considerably better than the other. The same grammatical principles were taught to each class. The results seem to indicate that the inductive presentation is more desirable for bright classes, while the dogmatic presentation is better for slower pupils. The inadequate number of cases used in the study and the lack of control over the quality of pupils and ability of teachers condition somewhat the general acceptance of this conclusion. Eurich (272), working with 169 university freshman students in an experimental group and 233 students of a similar type in the control group, evaluated the vocabulary growth of these students during an academic year. Marked improvement in vocabulary mastery was shown by the experimental group.

The relation of mastery of a usage to a knowledge of a rule covering it was shown in studies by Ortmeyer (331) and Qualley (339). Both studies dealt with instruction in punctuation and revealed the fact that there is little transfer from knowledge of a punctuation rule to the correct use of the skills covered by it.

Tangible evidence of the efficiency of using the group summary as a technic for teaching language in the first grade was offered by Kiefer (314). In this investigation she recorded eighteen summary lessons in first-grade language scattered over a year's work. The specific purpose was to secure verbatim records of these lessons as they were developed as a basis for their later analysis. The improvement in the ability of first-grade youngsters to produce individual summaries of the oral type and to participate in the preparation of the composition group summary was very marked. Kiesling, in a study in progress at the University of Iowa, analyzed these same data by means of certain objective criteria and the supplemental use of an oral language scale. Among the more apparent factors affecting quality in these first-grade compositions was conciseness of vocabulary choice and exactness in expression of an idea. Length of compositions in terms of number of words was found to be of little or no value as a criterion of quality.

Remedial Instruction

Studies by Guiler (292, 294), at both the elementary-school and college freshman level, showed very clearly the possibility of improving pupil mastery of the mechanical and usage skills in language through remedial instruction. Guiler (291) also reported an experiment involving a limited number of cases in the improvement of ability in pronoun usage in a ninth-grade class. Marked improvement was shown when the difficult principles were discovered for the pupil and suitable practice materials were provided. Gunn (296) reported the beneficial effect of a weekly drill period of twenty-five minutes in reading, vocabulary, and English mechanics on the test scores made on standardized tests by high-school pupils. Keener and Rowe (311), working with third-grade pupils, found that a signficant improvement resulted from the use of practice materials. Variables were carefully controlled throughout the experiment, although the number of cases upon which the conclusions are based is quite limited. Esslinger (271) showed the favorable influence of the use of a specific type of language drill material when used under typical classroom conditions. Quam (340) also reported the effective use of drills in the elimination of certain common punctuation errors.

Price (338) experimented with university students to discover whether remedial work in English should be given during the second or third year. In general he found that a better class attitude existed toward the remedial work among the more advanced students.

Measurement of Achievement

Studies of testing technics point the way to definite improvement in the construction of language test items. Haworth (302) constructed two types of test items of the same language usage content. One set of items was stated in a form to be recognized and corrected by the student; the other in alternate response form. No significant difference in the validity or objectivity of the test items was found. There were only slight differences in time consumed in the administration or correction of the test. However, from the standpoint of reliability the data showed a significant superiority for the correction form of the item. Stickney (357), in a similar type of study, showed evidence that the recognition-correction type of exercise was equally valid, slightly more reliable, and a great deal more economical from the standpoint of student and teacher time than the multiple choice form over the same material. Reno (342) compared results from a proofreading English Mechanics test and the Columbia Research Bureau English Test. According to his findings the proofreading type of test was slightly superior to the recognition test for the measurement of the same abilities. Kline (316) compared three types of forms of test items covering the same material. The results of his investigation support the conclusions of the previous studies. Powell (336) checked nine themes for each of 302 ninth-

grade pupils for the purpose of determining the efficiency of the error count in pupils' free writing, the error quotient, and an error analysis of performance on a long proofreading test. His data reveal a high correlation between error count and the error quotient procedure. However, the error count procedure is open to a number of very serious objections which practically invalidate it for classroom use.

Dolch (270) carried on an experiment in the measurement of word difficulty with forty children in grade six. Seventy words were presented to these pupils in columns with instructions that they were to mark with a zero all words which they did not know at all and with a question mark the words about which they were uncertain. Immediately after this, the seventy words were presented in a multiple choice form. Dolch concluded that multiple choice caught some of the guessing, but due to the fact that the multiple choice technic utilizes many wrong suggestions, it was impossible to discover precisely the extent of the pupils' word knowledge. In his opinion objective tests often fail entirely to show the true relative difficulty of words.

Kelley (312) experimented with a large group of pupils in grades five and six using five methods of testing word meanings. The pupil's ability to use the word correctly in a sentence was assumed as evidence of his knowledge of word meaning. Kelley concluded that the same-opposite-neither and multiple choice sentence tests were slightly lower in validity than the other types. The matching and multiple choice tests correlated most highly with the criterion. There was no improvement in the reliability and validity and little or no difference in the difficulty of multiple choice items in which the wrong responses were suggested by the examiner and those in which the students' own wrong responses to recall items were used. The multiple choice test form was found to be approximately twenty percent greater in difficulty than the multiple choice sentence test. According to Kelley, no one of the testing technics used proved adequate for use in the measurement of individual pupils.

CHAPTER V

Fine Arts

Methods of Teaching and Recent Trends

Few outstanding studies concerning methods of teaching art on high-school and college levels have appeared recently, although articles of a generalized and less scientific nature are numerous. Much of the research on the teaching of art in high schools and colleges can hardly be called scientific because of the lack of proper control groups or inadequate number of subjects for the types of tests used.

Several studies dealing with recent trends in art education have been made. Smith (415) and Whitford (425, 426), in summaries of trends in art education, reported that in the past decade the development of good taste and the creating of beauty in one's environment have become major objectives in the teaching of art; free expression is being encouraged, and the application of art in daily life stressed. Less formal and more creative activities are replacing former methods, the validity of which is beginning to be questioned by art teachers.

Hilpert (394) analyzed art courses in the public schools of forty-two cities (thirty-five of which were actually visited) in twenty-two states. He found that the subjectmatter was often unrelated to general objectives in the art courses, that little or no attempt was being made to allocate levels of art work to grade level, and that practically no attention was paid to group or individual differences.

Bird (370) suggested a new approach to the teaching of drawing in which observation and communication are stressed rather than imitation.

Crowley (378), in checking the effectiveness of five methods of teaching design on five groups of 680 high-school freshmen, found the direct observational method most effective. The "free interpretation" method proved very inferior.

Ulp (419) reported an experiment on the use of motion picture models on three groups of college art students. One group was composed of freshmen who had never drawn from life; a second group had had limited experience in sketch class; and a third group had had considerable experience. The freshmen, after two semesters, showed more improvement than the other two groups which had been trained with posed models. The lack of a control group lessens the value of the study somewhat, but this type of instruction may prove valuable and should be studied at greater length.

In studying the preferences of art materials and subjectmatter of 697 junior high-school students, Traill and Harap (418) found that painting

and drawing ranked first as art process preferences, animals and landscapes as subject preferences, and pencil and crayon as art mediums.

Influence of Training on Art Ability at High-School and College Levels

A number of studies showing the influence of training on art ability have been made. Since there are apparently some conflicting results among the different studies, this phase of art education should be studied further. Several of these studies are of special interest to those wishing to do further work on methods of teaching, since many results seem to indicate a gradual maturation of the art ability.

Carroll (374) found that training in art appeared to have little effect on the test scores and that in administering tests for art ability to college art majors there was a correlation of only .15 $\pm$ .07 between the art instructor's judgments of creative ability and the McAdory Art Test, and a correlation of .40 $\pm$ .06 between ratings of art instructors and the Meier-Seashore Test.

Lewerenz (400), testing forty-two high-school pupils electing an art course, found a correlation of .63 between test scores and the teacher's estimate of class work extending over a period of five months.

In a study of the effect of elementary and secondary public school art on the judgment of 481 pupils when considering problems of art in everyday life, Weldele (423) found the mean for city school pupils to be higher than for rural school pupils. No difference in scores was shown to be caused by chronological age, and the mean for pupils who had attended art exhibits was 12.85 higher than for those who had attended none. The author concluded that training in art is necessary for the average person to be able to appreciate art as it appears in everyday life.

Other investigators disagree in the matter of necessity of training in art judgment at high-school and college levels. Zinn (430), in a series of tests given to 1,116 public school children and 100 college students, indicated that maturity and experience aid originality in art and that originality seems to be a special skill.

Likewise, Wall (420) concluded from questionnaires concerning art, literature, music, and related subjects as answered by 758 school children from eight to sixteen years, that apparently esthetic taste is native and universal and that there appear to be three clearly separated stages in esthetic development, which seem to fall into the following age groups: 0-8 years; 8-12 years; 12-16 years. The conclusion of universality here does not seem to be warranted on the basis of these data; the arbitrary age groupings should also be given further study.

Williams (428) reported from a study of the sensitivity to color harmony of 600 children and adults a definite relationship between chronological age and test scores. A "leveling off" seems to occur at about the twelfth year.

Miller (408), however, carried out an experiment to determine the effect of isolated form on 1,014 junior high-school students. Age apparently has little to do with this type of esthetic judgment.

One thousand and thirty-one children with chronological ages between six and sixteen and mental ages between five and fifteen years were tested by Baron (369) for color discrimination. There appears to be no relationship between ability to discriminate colors and mental age, but a marked relationship between ability to match shades of the four fundamental colors and the mental age.

Shaffer (413) studied the interpretations of cartoons by approximately 2,700 children from grades four through twelve. The correlations of scores on the individual cartoons with mental age was .285 for grades four through six; .295 for grades seven through nine; and .242 for grades ten through twelve. Apparently the relationship between mental age and cartoon interpretation is low; but there appears to be a maturing of the ability to interpret cartoons which is proportional with mental age.

Research in Related Fields

Studies of the relationship of art ability to certain personality traits popularly called "artistic temperament" should be of value to teachers of art.

Carroll (373) reported no significant relationship between art ability as measured by the Meier-Seashore and McAdory tests, and personality traits as measured by the Bernreuter personality test, on a group of one hundred university students. No relationship was found between art and introversion, or emotional instability.

Carroll (372) also found from a study of ninety art students and forty-three non-art students of college level that the interrelationship existing among the capacities to appreciate art, literature, and music was very slight. Art and literature appeared to vary together more than art and music.

Hayden (392), Whitford (424), and Tannahill and Kurzband (417) have compiled bibliographies in the field of art education which will be helpful to workers carrying out further research in this field.

CHAPTER VI

Health and Physical Education

Definition and Limitation of the Field

THE boundaries of health education and physical education do not coincide. The two fields have an area in common, but they also have areas peculiar to each. Both are concerned with the making of desirable physical and psychological changes in individuals.

Descriptions and evaluations of health programs in city (435), county (431), state (432, 450), and rural districts (444) furnish a useful background against which to study special methods and relationships, since all aspects of the health program are inextricably interrelated. There are trends toward a more constructive and adequate program for all pupils, not only for the health deviates; toward instruction that stresses healthful living; and toward physical education that furthers the health, social efficiency, and culture of all pupils rather than cultivates intensively the athletic proficiency of the few. Investigations relating to programs and objectives of health and physical education have recently been summarized by Wood and Mealey (456).

Space does not permit the inclusion of other references, useful in giving a background in the field, such as the preliminary report of the Committee on Professional Ethics in Health and Physical Education (455); the history of health and physical education (448); the personnel for teaching health (446); and the relation of physical education to the health aim (451). This section is limited to investigations of the psychology and pedagogy of health and physical education in the elementary school.

Diagnosis and Individual Health Needs

The diagnosis of the health needs, capacities, and interests of individual children is prerequisite to health instruction. Brouillette (457) summarized previous surveys of physical deviates and reported the results of a medical examination of 2,262 elementary-school children. Of the thirteen kinds of defects studied the most prevalent were: defective tonsils (found among 72 percent of the children); defective teeth (58 percent); anemia (38 percent); intestinal parasites (36 percent); and malnutrition (21 percent). The percents of defect in this community differed considerably from the percents reported in other surveys and indicated the need of a health program adapted to the local community and of the better standardization of physical and medical examinations.

Cumulative record—One important instrument of diagnosis is the cumulative record. Hamer (458) constructed two types of cumulative record

cards based on a study of about seventy-five records in use in high schools. These records included information concerning the results of medical examinations, requirement fulfilments, attendance, and marks. These records were based largely on present practice. An evaluation of their usefulness in the development and guidance of individual pupils is still to be made.

The Learning Process

Little scientific work has been done during the past four years on the analysis of the learning process and on the nature of the mental operations involved in health and physical education. Most of the investigations have been merely exploratory.

Repetition of factual information—Pettit (519) found a repetition of many health topics common to each of the five series of texts analyzed. She proposed an experiment to ascertain the value of repetition in the teaching of hygiene. The optimum number of repetitions of health facts, time intervals between repetitions, and duration of learning periods should be studied.

Skill in sports—Miles has done outstanding work in the psychological analysis of certain athletic skills. He studied the individual and group reaction time in football charging (462), the effect of signal variation on football charging (461), and other phases of athletic skills. His work serves as an admirable model for other investigators. Aycock, Graaff, and Tuttle (459) sought to analyze one aspect of skill in swimming by studying the respiratory habits of trained swimmers. Griffith studied the factor of timing (460), made an analysis of types of errors in free throws (514), and studied the process of learning to drive a golf ball (513).

Learning a rhythmic pattern—Muzzey (463) studied the differences between a group of fifty white children and a group of fifty colored children, in grades two to six, in learning to respond to a typical rhythm. She used an electrical apparatus devised to record objectively movements of the large muscles. In all twenty-four trials the colored children made a larger average number of correct responses than did the white children, although the latter had had superior musical and rhythmic training. The colored children were not only superior to the white children in initial rhythmic ability, but also in rate of initial learning. The white children were less variable in their performance and made more steady progress in learning than did the colored group.

Relationships between Health, Motor Ability, and Other Factors

A study of the relationships among various factors involved in the process of health and physical education is useful in understanding the nature of the task. Relationships in physical and mental development have already been summarized (470). A few other relationships will be reviewed in this section.

Physical defects and other factors—McCollom (473) found that gains in height and endurance of 104 junior and senior high-school boys were associated with correction of kyphosis, lordosis, scoliosis, and flat feet, but increase in weight, chest expansion and capacity, and strength did not consistently accompany improvement of these four physical defects. The highest percent of improvement was made in the groups of lower intelligence and during the period of most rapid growth, namely, from fifteen to sixteen years of age. The author pointed out the need of more accurate and reliable measures and a study of a larger number of cases in each age group.

Maller (474) obtained a correlation of —.36 between incidences of defect of eyes, teeth, tonsils, and nutrition, and intelligence quotients of about 10,000 fifth-grade pupils in New York City schools. Even when social-economic status was held constant, the correlation between intelligence and health remained significant. Richey (476) compared retests of intelligence of 104 children who had had tonsillectomy and adenectomy performed in the interval between testing with similar retests of 100 children whose health reports indicated diseased tonsils or adenoids but who had not had these conditions corrected. This investigation, like others of a similar nature, failed to reveal any reliably significant changes in intelligence which could be attributed to a diseased condition of the tonsils and adenoids or to their removal.

In an extensive economic and health survey (480) in New York City a direct relation was found between nutrition and income. Of the children from the lowest income groups, 40 percent were rated "poor" or "very poor" in nutritional status as compared with 25 percent of the children from the higher income groups. Lininger (472) found that the pupils using milk at home and at school gained 45 percent more in weight, during a period of two years, than did those not using milk. The amount of milk consumed was found to be associated with the economic status of the families.

Motor ability and athletic skills—Data for 333 girls in two vocational high schools showed a low but significant negative correlation between scores on the Brace Scale of Motor Ability and the Pressey Senior Classification Test (475).

DiGiovanna (467) obtained evidence in support of the belief that posture and the ability to achieve in athletics are positively related. In his group of 123 boys in Athletic Class II, good posture was associated with somewhat superior achievement in every event except the basketball throw for goals. Taylor (479) studied the relationship between kinesthetic judgment and success in basketball playing. He selected from among fourteen tests of kinesthetic sensitivity six that showed correlations (special form of biserial r) of .40 or higher with success in basketball.

Physiological functions—Wells (481) reviewed the literature and reported the results of an original experiment on the effect of external tem-

perature changes on certain physiological functions. F. L. Harmon (468), in a carefully controlled laboratory experiment using two subjects, found that mental work is accompanied by small but consistent increases in metabolic rate, heart rate, and breathing rate and volume. Noise further increases these processes at first and puts a tax upon the organism during the period of adaptation. Leal (471), in investigating a situation involving 2,143 girls in grades four through twelve, found that girls maturing early tend to be taller than do those of the same age maturing later. The greatest variability was in ages eleven, twelve, and thirteen.

Tests and Measurements and Related Studies

Instruments of measurements are essential in the study of individual differences in health status and behavior and in the diagnosis of health needs and capacities. Bovard and Cozens (483) described and discussed the various types and practical uses of tests and measurements in physical education. They included chapters on anthropometric measurements; strength tests; cardiac functional tests; athletic ability and achievement tests for elementary school, high school, and college; neuromuscular control tests and indexes, and sport technic tests.

Measurements of growth and physical conditions—Increased interest in new methods of measuring the growth and nutritional condition of children followed the publications of the School Health Research Monographs of the American Child Health Association. Boas (482) stressed the importance of cumulative growth records of individual children. Miles (495) described the construction and use of a caliper for measuring skeletal diameters. Lucas and Pryor (494) reported work on the body measurements of 1,000 children in their effort to secure a simple and reliable index of nutritional condition. Shelton (503), from previous measurements, prepared a more practical and modern set of tables and roentgenograms of the normal osseous development of children from birth to twenty years of age. Lincoln (493) used two groups of about 100 seventh-grade pupils to test the reliability of eighteen anthropometric measures. These measurements made under ordinary school conditions proved highly unreliable. Even with an improved technic, perfect reliability was not secured.

Clarke (488) described an objective, fairly reliable method of measuring the longitudinal arch of the foot. The method of X-raying 6,000 children in New Haven seems expeditious, inexpensive, and effective in tuberculosis prevention (496). New paper films costing sixty cents per child for X-ray and development were used.

Measurements of athletic ability and achievement—Purcell (500) sought to determine the relative classification value of fifteen tests of athletic ability in sports and games by correlating each test with the summation of scores of the fifteen tests. He suggested the following tests as best for classification purposes: the 100-yard dash, the broad jump, the high jump, and the medicine ball put; the push-ups, the rope climb, and chinning; the

baseball accuracy, the dribble-in-tap shots, and the Burpee. Rodgers and Heath (501) reported on the semi-experimental use of knowledge and skill tests in playground baseball, and Edgren (489) on similar work in basketball.

Ratings—O'Neel (497) constructed a scale for the measurement of certain personality trait reactions in high-school physical education classes. The self-correlations between the two groups of student judges was extremely low, due, in part, to the lack of suitability, specificity, and concreteness in the items on the scale and to inadequate training of the judges. Snyder (504) suggested eight items for rating health practices, four of which emphasize accurate observation of overt behavior.

Questionnaires—Over a period of six years Seham and Schey (502) developed a health habit questionnaire and a health efficiency questionnaire which are "reasonably reliable and valid." These questionnaires should prove of decided value in the diagnosis of health habits and mild functional disorders of children.

Methods of Teaching Health and Physical Education

Teaching health—A few experimental investigations of different methods of health education have been attempted. Osborn (518) equated one experimental and five control groups of children in the fifth grade on the basis of initial scores on the Gates-Strang Health Knowledge Test, chronological age, and educational quotient. She measured progress in terms of health information, habits of cleanliness, and health interests. The children of the experimental group used an activity program consisting of the following features: checking on nine habits of personal cleanliness, observation by the teacher of the needs of each child and planned instruction in accordance with the individual needs, committee reports by groups of children, and individual reports of progress in the formation of health habits. In the control groups various conventional methods of instruction then in force in the schools were used. Each of the six groups made gains in health knowledge during the experiment. The experimental group showed a consistent, though not statistically significant gain, over the control groups. Schwieg (523) described a less carefully controlled experiment in which the many interesting health activities of the experimental group aroused general interest in health knowledge and practice throughout the entire school.

A larger number of descriptions of methods of teaching health are to be found in the literature. For example, McCormick (516) and Sorenson (524) discussed in a helpful way the use of natural life situations in the building of health habits. Pinckney, Miller, and Pettus (520) have written a practical, concrete, and valuable guide for elementary-school teachers based on their experience with school health work in Texas.

Visual aids—The first step in studying the effectiveness of visual aid in health education is to list, describe, and evaluate theoretically the various

kinds of visual instruction as they apply to health education. This, Conrad (510) has done. In his list are included blackboard illustrations and teaching devices, films, charts, posters, classroom specimens, and class excursions. The next step is to study experimentally each of these aids in health education.

Teaching athletic skills—More adequately controlled experiments on methods of teaching skills are needed. Cozens (511) found improvement in certain types of track and field events more marked when the practice periods were spread over a considerable duration of time than when practice was concentrated. In dart throwing, however, Luh and Liang (515) secured the highest efficiency after the fifth and sixth hours of twelve hours' continuous throwing. The middle third of this long practice period was the most efficient and the last third, least efficient. Schnitman's description (522) of a mass drill which seemed to give excellent grounding in the fundamental skills of basketball and Olander's description (517) of methods of teaching football skills are two examples of many articles describing methods of teaching various athletic skills.

Next Steps Needed in Research

Sufficient surveys of health and physical education in elementary schools have been made to reveal the inadequacies of present programs. There is need of genetic studies of the development of healthful behavior in children. Case studies of individual children should be made over a period of years showing changes in physical conditions and habits, knowledge, and attitudes relating to health. Not only the end results but also the process of learning should be studied in order to ascertain the conditions favorable to the building up of habits of living that will aid the optimum functioning of each individual.

Suggestions for research in this field have been made by Griffith (527), Williams (529), and Browne (526). A program of research in this field might well include the following features:

1. Continuous critical descriptive records of the development of programs of health and physical education in selected schools.
2. Continuous study of pupils as suggested above.
3. Intensive studies of relationships among factors such as health and scholarship, health and conduct, health habits and health knowledge, etc.
4. Experimental situations in which the outcomes of certain changes in procedures are recorded.
5. Controlled classroom experiments in which the results of different methods and materials are compared.
6. Controlled analytical laboratory experiments which furnish accurate facts on specific questions and suggest leads for classroom procedures.

CHAPTER VII

Reading

THIS section summarizes the contributions of 83 scientific studies to the psychology and methods of teaching reading in elementary schools. The plan adopted in preparing the summary differs somewhat from the usual procedure. The bibliographies prepared annually by the writer covering the period from July 1, 1931, to June 30, 1934, were first checked by Doctors Gates, Horn, and Yoakam for completeness. Any omitted published studies were added to the list. It is only fair to say that many important unpublished studies were omitted. The cooperators next checked all references which in their judgment contributed to an understanding of the psychology and methods of teaching reading in elementary schools. The checked lists were then compared and all references reviewed which had been checked by two or more members of the group. A summary was next prepared in preliminary form and submitted to the cooperating experts for criticism and suggested revisions. These suggestions were then assembled by Doctor Gates and the revised copy returned to the writer for approval or further changes. On account of the limited space available, it was impossible to include many personal interpretations of the results of the studies or criticisms of the technics employed.

Successive Emphases in Method

Throughout the history of American education, one major emphasis has succeeded another in teaching reading, as shown clearly by N. B. Smith (608). For example, during the colonial period, oral reading and memorization were emphasized vigorously. During the post-revolutionary period, major emphasis was given to elocutionary delivery and to correct pronunciation and enunciation. During the middle half of the nineteenth century, the word method was substituted for the alphabet method. Before the end of the century, the sentence and story methods, on the one hand, and the phonic and phonetic methods, on the other hand, received large emphasis in many schools. From 1880 to 1915, the literary ideal dominated reading instruction. In this connection, large use was made of new technics to awaken interest in and to arouse appreciation of literature. More recently, chief attention has been given to the improvement of silent reading. This has resulted in the development and use of numerous technics and procedures to promote growth in habits of intelligent silent reading and to stimulate interest in and motives for independent reading. One of the lessons which these facts teach is that the methods and content of teaching are influenced to a greater or less extent by changing educational objectives.

Systematic versus Incidental Training in Reading

In attempting to determine whether regular reading periods should be retained in the daily program of elementary schools, Bonar (542) summarized various studies and reports concerning the relative merits of incidental and systematic training in reading. The facts presented showed that both types of training have value; they also justified the conclusion that there is a distinct place for systematic training in reading at the elementary-school level.

Reading Readiness

The importance of appropriate training and experience before pupils learn to read has been emphasized repeatedly during recent years. In an effort to determine limitations in the child's previous experience, Waters (615) prepared a list of concepts or experiences required to interpret the material in fifty available primers and first readers. She then examined thirty-one kindergarten children to find out which of these necessary experiences were lacking. Those most lacking related to birds, the zoo, the seashore, the circus, and picnics. It is obvious that different results might have been secured in other kindergartens. Waters next reorganized the kindergarten program in order better to supply the needed experiences. Similar steps were recommended in the case of each beginning class.

Lee, Clark, and Lee (579) supplied additional evidence of the validity of the reading-readiness concept, as well as of their own "reading-readiness test," by correlating the scores on the Lee-Clark Reading Readiness Test given to entering first-grade pupils in seven schools with the scores on reading tests given at the end of the first and second semester. The correlation between two types of scores was .54 in the case of the Gates Silent Reading Tests, Types 1, 2, and 3; and .68 in the case of the Lee-Clark Reading Test. These correlations were much higher on the average than those between success in reading and ranks on a kindergarten rating scale or teachers' estimates.

Much interest has been expressed recently concerning the optimum mental age at which children should learn to read. In a study of bright, average, and dull children at the four-year mental level, Davidson (552) found that bright, average, and dull children with mental ages of four did not learn to read equally well under the same experimental conditions. The bright three-year-old children with mental ages of four were superior to the average four-year-old and the dull five-year-old children. These findings suggest that a mental age of six and one-half years may, as some writers maintain, not be necessary in order for bright children to learn to read effectively. Davidson's conclusion to the effect that some children of a mental age of four can "learn to read in a manner comparable with the success of average first-grade children," doubtless has some validity but is not directly supported by the evidence presented in the report.

Merits of Different Methods of Beginning Reading

Keen interest continues among school officers and teachers in the relative merits of different methods of teaching beginning reading. For example, Bergman and Vreeland (540) compared the progress of first-grade pupils taught through the use of the Picture-Story Reading Lessons and a visual method, so called from its wide use of stereographs and the stereopticon. The two methods which aim at widely different results are similar in that each endeavors to develop a well-selected vocabulary at the end of the first semester. The tests of word recognition used indicated that the Picture-Story Method was the more effective. As pointed out by the experimenters, other measures of progress are essential before final conclusions can be drawn. Gatto (562) also reported the results of a study in twenty-one Pittsburgh schools to determine the relative effectiveness in the grade 1B of two reading systems, the names of which were not given. They had been ranked about equally high by the textbook committee. Conclusions were based on the progress made by the pupils and on the teachers' ratings of the two systems. The teachers' ratings and the test results both indicated a slight superiority of one system over the other.

Value of Printing, Cursive Writing, and Manuscript Writing in Teaching Beginning Reading

With the introduction of manuscript writing, renewed interest has been expressed in the type of writing that can be used to greatest advantage in teaching beginning reading. Long and Mayer (582) compared the progress of two groups of 500 children each taught to read through the use of print and cursive writing respectively. The former proved much more effective in teaching pupils to read print. No study was made of the effect of the use of the two methods on reading script or in learning to write. Voorhis (614) compared the relative merits of cursive and manuscript writing in first-grade classes. All the evidence secured indicated the superiority of the latter, both in teaching reading and as a form of writing for primary pupils.

Size of Type and Readability

Buckingham (545) carried on an elaborate experiment to determine whether first-grade pupils can read 12-point type more easily than they read 14-, 18-, and 24-point type. Simple material was printed in these various types with the same and with different leadings. The relative efficiency of the various types was measured in terms of rate of reading. The rank order of the type as determined by the records secured was 12-point, 18-point, 24-point, 14-point. The natural inference from this finding would be that 12-point type could be used in first-grade books to distinct advantage. This experiment is open to pointed criticisms. It fails to consider many very important criteria such as eye-strain. The findings are not in harmony with those of previous investigators; furthermore the rank order

of the type as reported above suggests chance variations. Further experimental study is essential before radical changes in the size of type used in beginning reading books are justified.

Methods of Attacking Words in Primary Reading

The methods by which pupils attack words were studied by Wilson (616). She identified the following technics among twenty second-grade pupils: "intelligent guessing of words from the context or thought"; "met new word—usually slight hesitation—often repeated—inserted or omitted word—changed order—apparently shifting attack to try and get thought"; "appearance—studies word-length, general shape, some one striking clue"; "mechanical analysis." The number of methods used was next compared with the achievement of the pupils in both oral and silent reading. The results showed clearly that the pupils who made use of all four methods were superior on the average, in both types of reading; the average achievement of those using three, two, and one method was correspondingly less.

Value of Phonetics

The specific values and limitations of phonetics as an aid in learning to read were studied by Garrison and Heard (560). The pupils included in the experiment began school in September 1927 and continued through the first, second, and third grades until May 1930. The children were divided into two groups—the phonetic group, receiving training in phonetics during the first two years; and the non-phonetic group, receiving no such training. Both bright and dull children were included in each group. There is some question concerning the adequacy of the control of all the factors involved. Detailed studies of the achievement of pupils in reading and spelling were made at the end of each year; the amount of loss during summer vacations was also determined. The data collected led to the following conclusion: "Training in phonetics makes children more independent in the pronunciation of words"; "children with no phonetic training make smoother and better oral readers in the lower grades"; "bright children profit more than dull children from the early introduction of phonetics"; "for all children, phonetic training seems to be more effective in the latter part of the primary grades"; "the phonetic group made more progress in spelling than the non-phonetic group"; "the first-grade children with no phonetic training seem to lose less during vacation than do children with such training." These findings suggest that there are many issues which must be considered in reaching final conclusions concerning the place and value of phonics in the primary grades.

Value of Activities and Integration in Promoting Growth in Reading

Several studies have been reported concerning the value of activity curriculums and integrated programs in promoting growth in reading.

J. M. Lee (580) reported the results of a first-grade reading survey in California which showed that the schools which reported "a great deal of activity" ranked definitely lower in silent reading achievement than those reporting "some, very little, or no activity work." In all probability many of the schools reporting a great deal of activity also provided systematic training in reading. It is unfortunate that more precise records of the amount of activity used in the different schools was not secured.

Hopkins (572) reported the progress of the pupils in grades two to eight inclusive in the Lincoln School of Teachers College, Columbia University, which follows an "activity curriculum" in which relatively less attention is given to formal instruction in reading than is provided in a subject curriculum. The results of the Stanford Achievements Tests showed that the pupils make achievement scores comparable to those of like "age, grade, and intelligence in the general school population." Unfortunately, these tests do not measure progress in all phases of reading. Furthermore, no report was made concerning the number of problem cases which develop or the amount of individual help which is provided.

Meriam (590) reported the progress in reading of Mexican children who attend a school which follows an "activity curriculum." The objectives of the school are not achievement in the three R's, but rather play for wholesome fun; "stories for a higher type of leisure," and "hand-work that is useful and ornamental." Definite effort is made to stimulate interest in attaining these objectives. Provision is made for much silent reading by each pupil. There is oral reading in groups, but never to the teacher merely to show how well they can read. Books are read at home, not as assigned work, but by choice to enjoy the story. Measurements of achievement in reading in the first four grades showed more than the normal amount of progress. It is obvious that the reading program followed involves many distinct phases, including some systematic training, and that the study was too loosely controlled to justify final conclusions.

Crawford and L. Gray (550) measured the progress in reading between September 11 and January 29 during which a fifth-grade English class devoted itself to "a puppet show activity." The progress as measured by the Stanford Reading Test was somewhat greater in both reading vocabulary and comprehension than is normally attained. Howell, Dunn, and Stoker (574) reported the progress in reading of pupils in grades three to six inclusive of a school in which an "integrated program" is followed. The results showed "satisfactory results in fundamental skills." Unfortunately, no statement was made concerning the extent to which systematic training in specific phases of reading was provided.

Individual and Group Differences

It is often assumed that if bright children are assigned to the same section or class, the result is a homogeneous group. Scheidemann and M. S. Smith (604), in a survey of an opportunity room for gifted children, found

that they may be average or inferior in other traits. It follows that only one of many variables has been held constant when pupils are grouped on the basis of intelligence, and that teachers of reading must study the individual differences and need of bright as well as of slow children. In order to determine differences in the study habits of sixth-grade children, Mitzelfeld (592) organized a questionnaire under four different headings, namely "pronouncing unknown words," "finding the meaning of unknown words," "behavior in work-type reading," and "behavior in recreational-type reading." The pupils were classified into two groups: Group I, those who had reading difficulties; and Group II, those who did not. Significant differences among groups were noted in the replies: Group I showed a greater tendency than Group II to pay no attention to unknown words and to read right ahead, to pronounce words in a loud whisper, and to use the dictionary more frequently when they did try to determine the meaning of unknown words. Group II showed a greater tendency than Group I to guess at the pronunciation of words, to look for little words or parts of words in unknown words when trying to determine their pronunciation, to use the dictionary wisely in getting pronunciations, to determine meanings from the context, and to look up words only when they were key words.

A partial explanation for some of the individual differences reported is found in the fact that a given pupil differs from time to time in many essential traits and qualities. For example, Dewey (554) found, in a study of the consistency of pupil responses to a comprehension test, that bright pupils were not consistent more than two-thirds of the time and dull pupils not more than one-third of the time.

Classifying and Adapting Reading Instruction to Needs of Pupils

Several experimenters reported evidence of the value of classifying pupils and providing instruction in reading adapted to their needs. Clark (548) graded pupils primarily on the basis of chronological age, classifying them within each grade chiefly on the basis of reading ability. McElwee (585) formed homogeneous groups in grades 1A to 4B on the basis of intelligence scores, reading achievement scores, and teachers' estimates of their ability. Dvorak and English (557) studied the needs of fifty pupils in grades 3A to 6A inclusive who showed the greatest deviation from normal expectancy and adapted instruction to their needs. Horrall (573) compared the progress of selected and unselected groups at the fifth-and sixth-grade levels. H. A. Gray and Hollingworth (566) compared the achievement of gifted children enrolled and not enrolled in special opportunity classes. All of these studies supplied conclusive evidence of the value of adapting instruction to the needs of each group. Mere segregation, however, without adaptation of instruction, was shown to be ineffective. In the case of superior children, "the advantages to be hoped for from homogeneous grouping" are "not so much in expectation of greater achievement

in the tool subjects (reading, arithmetic, spelling) as in an enrichment of scholastic experience with additional intellectual opportunities" (566:261). As is shown clearly by Dransfield (555), opportunities for enrichment can be increased by reducing the recitation time and providing "self-administering instruction units" which can be pursued independently under the guidance and direction of the teacher.

Relative Merits of Different Methods of Improving Silent-Reading Achievement

Limb and Parker (581) conducted an experiment in grades three to seven inclusive in Australia to determine the relative merits of regular class teaching of reading with and without the use of the Crabbs-McCall test lessons in reading. The results led to the conclusion: "It is possible, by practice for two or three half-hour periods weekly, to improve the efficiency of a primary school group in one specific type of comprehension; but there is little evidence that the amount of practice which can be given in three months is sufficient to result in permanent improvement" (581:48). In a comparative study of the merits of "workbook material" and "picture-dictionary material" at the first-grade level, Pierce and Quinn (600) found that there was very little, if any, difference in the gains made by the groups using the respective materials, as measured by the Pressey attainment scales for grades one and two. In tests of word recognition, however, "the picture-dictionary material is at least equal to, and possibly has a certain degree of superiority over, the workbook material" (600:603). The fact should be pointed out that the materials compared were designed for different purposes and that the progress achieved through their use is hardly comparable.

Two experiments have employed extensive library reading. Hilliard (569) compared extensive library reading with specific drill as a means of improving silent-reading achievement among fifth-grade pupils. The Sangren-Woody Silent Reading Tests were used in measuring progress. At the end of eight weeks, both the extensive library group and the specific drill group made larger average gains than did the control group which followed the usual reading procedure. An analysis of the scores made on the separate parts of the tests showed that "extensive library reading seems to produce larger gains in such abilities as rate, total meaning, and following directions; while the specific drill method secured greater growth in knowledge, fact material, central thought, and organization" (569:11). Glover (564) compared the progress of fifth-grade pupils as a result of "systematic skillful instruction" in reading and of extensive library reading. The results, as measured by the Sangren-Woody Silent Reading Tests showed that the latter method was more effective than the former in the case of both bright and slow pupils. Unfortunately, the gains on the different parts of the test were not reported as in the case of Hilliard's study.

The foregoing studies justify the conclusion that various types of train-

ing, including wide independent reading, have specific value in improving reading achievement. It remains to determine the conditions under which each type can be used most effectively.

Methods of Improving Reading Achievement in the Content Fields

W. S. Monroe and Engelhart (594) summarized the results of various studies relating to the need for and methods of teaching the reading of arithmetical subjectmatter. They concluded that pupils should receive appropriate training, but that further research is necessary to determine the nature of instruction that is most effective. In a subsequent study (595), the value of systematic training in reading verbal problems was studied in the case of fifth-grade pupils. Unfortunately, the conditions under which the experiment was conducted were not sufficiently controlled to justify final conclusions.

Value of Practice Exercises of the Work Type

Closely associated with studies of methods of improving reading achievement in the content fields are those which aim to determine the value of exercises in reading of the "study" or "work type." Jacobs and Liveright (575) gave specific training to fourth- and fifth-grade pupils to improve ability to find answers to questions, to follow directions, to discover the central thought, to decide upon the total meaning, to organize thought in various forms, and to increase rate of reading. Sibley (606) diagnosed the needs of third-grade pupils with respect to each of the phases of reading listed above and provided special training adapted to the needs of the pupils. The results of both studies showed "the undoubted value of definite attention to the teaching of study-type reading" (575:459). Gatto (563) reached similar conclusions in a study among fifth- and sixth-grade pupils to improve vocabulary, the selection of central thoughts, the location of information, outlining, original questions, recall, following directions, reproducing, answering, problem-solving, interpreting of tables, summarizing, etc. The gains were greater in the sixth-grade sections, suggesting that a certain degree of maturity may be essential for maximum gains, or that materials and methods were better adjusted to the abilities and needs of pupils in the higher grade.

The Direct versus the Incidental Method of Increasing Meaning Vocabulary in History

The problem of increasing the meaning vocabulary in the content fields is a very challenging one. In order to determine the relative merits of direct and incidental methods, E. Holmes (571) conducted a series of experiments with fourth-grade history classes. The results showed the superiority of the direct method in increasing vocabulary, in improving

both oral and silent-reading achievement, in promoting fluency in oral discussion, and in sustaining the child's interest in a topic.

Growth in Meaning Vocabulary in Mathematics

Pressey and Moore (601) gave vocabulary tests, covering 106 technical words in arithmetic, 49 in algebra, and 88 in geometry, to determine growth in meaning vocabulary in these fields from the third grade through high school. The results showed that certain terms, such as "minus," are learned early and remembered. Other terms, like "altitude," are learned slowly but steadily. One of the striking facts emphasized by the test papers was the inadequate mastery of the fundamental vocabulary of the field by many pupils.

Relation between Rate and Comprehension

Tinker (613) summarized studies of the relation between rate and comprehension, pointing out the fact that at least three different technics have been employed by investigators. In the first, rate is compared with ability to recall what is read; in the second, rate and comprehension scores have been obtained on different materials; in the third, rate and comprehension have been measured on identical materials. The correlations derived have been consistently high in the latter case. Tinker maintained that the third method is the only valid one to use. Data secured on this basis justify the conclusion that "there is a close relationship between speed and comprehension in reading." The fact should be pointed out that the term "comprehension" is used somewhat loosely in this study. The results may differ for completeness of comprehension and for depth or level of comprehension.

Factors Involved in the Appreciation of Literature

Mrs. Smith (607) prepared a list of sixty-eight factors regarded by experts in the field as involved in learning the arts. Questionnaires were distributed to teachers of English and reading in twenty higher institutions during a summer session with the request that the items be listed in the order of importance in developing appreciations. Returns were received from twelve institutions. There was general agreement that the following factors ranked high in importance: "comprehension of meaning"; "ability to correlate the thought of the selection with the learner's past experiences and to recognize the familiar"; "learner's imagery—power or ability to get word pictures, including the ability to recall, invent, and review past experiences"; "students' attitude, whether favorable and receptive including feeling of at-homeness and self-identification"; "adaptation of material to the learner—ease, sureness, confidence, and facility in reading"; "appeal to the interest of the learner so the selection will attract his attention and arouse him to action"; "character of the initial presentation"; "practice in reading good literature." This list is very illuminating and

suggestive. There is a danger, however, that some of the terms used may not be uniformly interpreted. Furthermore, experimental studies of the factors named are essential before the validity of the ranks assigned to them can be fully accepted.

Relationship between Intelligence, Reading Ability, and Other Factors

The relationship between social, economic, and personal characteristics, especially intelligence and reading achievement, has challenged wide interest. Ladd (577) gave group tests of "silent reading, intelligence, socio-economic status, play interests, personality, and school attitudes" to 315 pupils in grades 3B to 5A inclusive in three schools of New York City. No marked relationships were found between reading achievement and socio-economic status of the home, play interests, or general personality adjustment. The correlation between reading age as determined by three tests and the Haggerty Intelligence Examination Delta 2, was .71, and between reading age and the Pintner Non-Language Mental Test was .24. The use of reading in the Haggerty Test doubtless contributed to the higher correlation. Evidence in support of this assumption was presented by Durrell (556) who found that intelligence scores varied with the leading achievement of children, by Lowry (584) who studied the gains made on intelligence tests after reading achievement had been increased, and most clearly of all by D. M. Lee (578).

In an elaborate study of reading in grades four, five, and six, D. M. Lee (578) gave a battery of intelligence and achievement tests and studied the relationships of the scores. She found that "the correlations between reading scores and mental age are appreciably higher (about .30) for the sixth than the fourth grade. . . . The correlations between reading scores and I.Q.'s show no consistent trend through the grades." By an ingenious statistical device she eliminated the influence of intelligence from achievement in school subjects and reading. The resulting data showed a high correlation between achievement in reading and the other subjects. "The correlations between reading scores and achievement scores are highest for the fourth grade (about .79), but higher for the sixth than for the fifth." She found, furthermore, that reading ability of less than a grade score of 4.3 was detrimental to the progress in school subjects of all pupils regardless of I.Q. in grades four and above. She concluded therefore that "it is most important for each fourth-grade pupil to acquire an ability to read general material at least equivalent to the beginning fourth-grade norm" (578:60).

Stevens (609) correlated the scores of several hundred pupils in grades three to seven inclusive on tests of "general reading ability, arithmetical reading ability, 'intelligence,' arithmetic problem solving ability, and ability in the fundamental operations of arithmetic," and found that tests of problem reading correlate higher with tests of problem solving than do tests of general reading or of fundamental operations. The investigator pointed out the need of further studies of relationship in this field.

Causes of Serious Deficiencies in Reading

The literature relating to unusually deficient readers has increased rapidly during recent years, as shown by a summary prepared by Tinker (612) of 180 studies of "diagnostic and remedial reading." The chief causes of reading deficiencies which were reported are low mental ability, congenital word blindness, heredity, conditions related to cerebral balance, faulty basic habits, abnormal emotional-reaction tendencies, and deficiencies in visual, auditory, or kinesthetic perceptions and memories.

As a result of an elaborate study including 415 children, M. Monroe (593) classified the causative factors in reading disabilities under seven general headings: visual, auditory, motor, conceptual, methodological, environmental, and emotional. Under visual aspects of reading were "lack of clear-cut retinal images, due to defects in the refractive mechanism of the eye" and lack of precision in discrimination of "complex visual patterns" and of the "spatial orientation of patterns." Under auditory aspects of reading were "lack of auditory acuity due to partial deafness" and lack of precision in the discrimination of speech sounds and of the temporal sequence of sounds. Under motor aspects of reading were "lack of precision in the motor control of the eyes," of speech, and in "directional motor responses." Under conceptual aspects of reading were "lack of vocabulary" and "lack of facility in the organization of language." Various specific causes were listed under methodological, environmental, and emotional aspects.

Parker and Waterbury (598) reported the following "major causes of, and factors in increasing reading disability" as identified through observation and special study under school conditions: lack of kindergarten training; ill-advised placing of pupils in grade 1B to begin formal reading; pressure exerted by teacher to complete a given number of lessons; reliance on the volunteer response method of conducting drill, tendency to "belittle the learning power of pupils"; neglect of pupils pending clinical examination; failure to discover severe cases of reading disability; and failure to bring cases of marked disability to the principal's attention. Undoubtedly, these and other practices contribute to slow progress in learning to read.

Various investigators have been interested of late "in the relations of lateral dominance of the hands, eyes, and ears, and visual acuity and eye-muscle imbalance to difficulties in reading." For example, in an extended study of lateral dominance and visual fusion, Selzer (605) found a definite correlation between muscular imbalance and mirror reading, as well as the type of difficulty characterized by reversals, omitting letters, and substituting letters. His studies led him to the extreme conclusion that muscle imbalance and alternating vision account for most, if not all, of the reading disabilities not accounted for by general mental disability. He described and made use of a technic for detecting muscle imbalance and showed that the reading defects resulting from it can be corrected through the use of prisms in lenses.

Within the last few years, the theory of the relationship between dominance and reading disability has gained wide recognition. However, increasing skepticism has been expressed during the last three years concerning its validity. For example, Crider (551) pointed out the need for more experimental evidence relating to the issue. Gates and Bennett (561), after an extended study of reversal cases, advocated the "acquired habit" theory rather than the "brain organization" theory in explaining the relation of handedness and eyedness to reversals. Dearborn (553) preferred to explain reading disability in terms of the direct influence of left-eyedness and of mixed and of crossed conditions upon the process of learning rather than in terms of cerebral localization as proposed by Orton.

The practical difficulties caused by reversals in reading have led to much study of their causes. The various studies of reversals by Gates and Bennett (561), Phillips (599), Dearborn (553), Woody and Phillips (619), and others do not provide conclusive evidence of an invariable relation between handedness or eyedness and reversals. These findings give support to the view of Gates and Bennett and of Dearborn which were reported in the preceding paragraph.

One or more specific causes of reading disability have been emphasized by different investigators who have reported studies during the last three years. For example, Hegge, Sears, and Kirk (568) discussed a number of cases of reading difficulty due, in part, at least, to mental retardation or deficiency. Richards (602) explained the deficiency of one case in terms of deficient visual imagery. Eames (558) found that in the case of poor readers the eyes are more exorphic at the reading distance than is normally true, and that hypermetropia is also more common. Anderson and Kelley (538) found that boys are more frequently poor readers than girls and that speech defects are more common among poor readers than others. Birdsall (541) reported that retarded and superior readers differed "in methods of attacking unknown words," "in methods of reading," and "in imagery and association." Further studies are necessary to determine the extent to which such factors are definitely causal.

Remedial Procedures in Reading

An unusually large number of studies dealing with remedial procedures have been reported. Unfortunately, many of them are so technical in character that they are of value chiefly to the clinical psychologist. The major findings, however, have significant implications relative to classroom practice.

The most elaborate discussion of remedial procedures published during the last three years was prepared by M. Monroe (593) as a result of diagnostic and remedial studies involving 415 children. The methods recommended relate to the following difficulties: faulty vowels and consonants, reversals, addition of sounds, omission of sounds, substitution of words, repetition of words, and addition of words. Because of their detailed character, it was impossible to summarize them here.

In a summary of the remedial treatment reported in previous studies, Tinker (612) called attention to several specialized technics used in severe cases of reading disability: the old-fashioned *a-b-c* method, including the spelling of words, recommended years ago by Hinshelwood; phonetic spelling by Schmitt; the kinesthetic method of training non-readers, recommended by Fernald and Keller; and a modification of the kinesthetic method by Gates in which print rather than script characters are used in writing and in which greater emphasis is placed on similarities and differences in words. Tinker pointed out that experimental evidence was lacking to indicate which of these methods was the best. In some cases, they were organized to serve distinctly different cases.

The studies relating to reversals suggest a variety of methods for preventive and remedial purposes. Teegarden (610) suggested that right habits are initiated in the kindergarten, as children give close attention to form, position, and sequence in various activities, including the manipulation of materials, make discrimination of size, form and color, see similarities and differences, and form judgments. Gates and Bennett (561) emphasized the importance of the "explanation and demonstration of correct eye-direction of attack," the use of a primer dictionary, the "introduction of study of word characteristics," in certain cases, the use of the finger as a guide, the use of other motor aids, such as those recommended by Keller and Monroe, and the vocalization of the word elements as they are seen.

In dealing with special disability cases, characterized by muscular imbalance, suspenopsia, and alternating vision, as well as reversals, Selzer (605) found that special lenses with prisms were very helpful. In cases similar in many respects to those of Selzer's, Dearborn (553) recommended the tracing method as the words are pronounced, "thus synchronizing the movements of the hand and eye with the sounds of the words." In the case of the older children the use of the typewriter in learning to read may prove very valuable. Of even greater importance, according to Dearborn, is the individualization of instruction and sympathetic guidance.

Hegge, Sears, and Kirk (568) in a study of mentally retarded pupils presented arguments and evidence in support of the contention that non-readers and poor readers may be "true reading cases" as judged by three factors: the existence of a specific retardation in reading as compared to mental age and arithmetical computation ability; the prevalence of anomalies of reading and other anomalies which in reading cases of normal intelligence may be taken to explain the retardation in reading; and trainability, the tendency of reading anomalies to disappear and reading grade to go up. In harmony with this theory, the methods employed in their study were adapted to special needs as revealed through diagnosis. Kirk (576) applied the tracing method to a group of subnormal children and found it more effective than the use of a conventional sight method. He pointed out, however, that further research is necessary to determine if

this conclusion "is applicable to all subnormal children, to normal children, or whether the subnormal and the normal differ in these respects." The need for further discriminating studies in this connection is emphasized by the wide use of the tracing method reported by Woods (618) and others among non-readers who are seriously deficient in reading.

In dealing with "a case of reading disability due to deficient visual imagery," Richards (602) reported the use of the following methods: learning the alphabet, establishing sound association with letters and words, using writing to promote "kinesthetic-visual-auditory" associations, and repeating constantly. In summarizing the study, Richards maintained that a few hours of special attention to insure a phonic basis would have prevented reading disability in this case. Such a conclusion is interesting but lacks scientific evidence as far as the data presented are concerned.

Reading Interests

Three summaries of children's reading interests and preferences have been published during the last three years. One was published by the National Education Association (597) to determine answers to such questions as: What do children read? What factors influence their choices of magazines and books? The studies reviewed are reported separately. A second was prepared by the Sub-Committee on Reading of the Section on Education and Training of the White House Conference on Child Health and Protection (591). It emphasized the significance and present status of children's interests in reading and the need for more adequate reading materials and library facilities. The third was prepared by Coxe (549) and was concerned particularly with the amount of independent reading which children may be expected to do, the kinds of books and magazines which children read, the qualities which make books readable for children, and the methods which may be employed in arousing interest in good reading.

Abbott and Williams (537) made a questionnaire study of the magazine reading interests of 500 pupils in grades four to seven inclusive. The magazine which outclassed all others was *Child Life*. Other popular magazines were *Boys' Life, Playmate, American Boy, Open Road for Boys,* and the *National Geographic Magazine.* Many adult magazines were also reported frequently.

In a study of the reading interests of gifted children, Witty and Lehman (617) secured data concerning the same group in 1924 and again in 1929. The findings showed that "the amount of time devoted to reading increased with advance in chronological age," that there had been distinct changes in the kinds of reading enjoyed most, that the magazines read in 1929 differed widely in quality, and that the large amount of fiction read was undoubtedly the result of "special impetus and motivation provided by the home and the school."

The voluntary reading of unselected groups of children has been discussed in three extensive studies. A. Holmes (570) reported the quantity

and quality of the books read voluntarily by pupils in grades four to eight inclusive in four public schools of Toronto, Canada. The average number of books read per month was about two. The range for the year was from 0 to 108. The average number read during the year by girls was 18.3 and by boys 15.3. The proximity of public libraries had a decided effect on the amount read. The percent of desirable books read varied from 29.8 in one school to 59.9 in another. The voluntary reading of boys and girls averaging eleven years of age who attend a given library in England was reported in terms of the books enjoyed most and the stories liked best (547). The younger girls enjoyed fairy stories most and the remainder "school stories." The boy was found to be "the much more interested and interesting reader. His interests are much more varied, and he generally knows when he comes to the library what he wants." Bell (539) reported the results of a study of the reading of fifth-grade children, white and colored, in Louisville, Kentucky, which indicated "similarity in reading interests of the two groups in spite of unequal reading ability." It was impossible to determine from the data presented whether the similarity was due to common interests or availability of the same kinds of books.

Boney (543) studied various phases of library reading in the primary grades, as reported in courses of study and professional publications. Nineteen suggestions for arousing the interests of children in reading were reported, such as making trips to the library; giving special programs, dramatization, pageants; using posters advertising books; providing an abundance of interesting reading material; encouraging pupils to help select books for the reading table. Gould (565) concluded a study of the classroom library by pointing out the following ways in which strong motives for and permanent interests in reading may be stimulated: through a knowledge of and interest in good books on the part of principals and teachers; by making books available to pupils; by the use of "good motivation on the part of teachers"; by reducing book reports to a minimum; and by a wise selection of simple, interesting books.

Children's Preferences for Pictures and Picture Books

Brief reference is made here to four studies which are concerned with children's preferences for pictures and picture books (559, 587, 588, 589). Although these studies are not concerned with reading in the limited sense of the word, the results have a direct bearing upon children's preferences for illustrated books.

Methods Used in Campaigns To Improve Reading Instruction

The value of carefully planned campaigns to improve reading instruction has been demonstrated repeatedly. The methods employed vary with the purpose of the experimenter and with the types of improvment desired. Lowry (583) tested the achievement of pupils in grades four to eight inclusive, provided time-pressure drills on easy narrative material, and organized drill exercises from history textbooks. Camp (546) diagnosed the

needs of pupils in grades four to seven inclusive, provided specific training in accuracy of recognition and pronunciation, practice in oral reading, and specific standards relating to the form and quality of oral interpretation. Manwiller (586) made a survey of the reading achievement of pupils in Pittsburgh in grades four to eight inclusive and organized specific remedial programs based on the deficiencies and needs discovered. Appraisals were made of the value of specific methods of improving vocabulary, rate, fact material, total meaning, central thought and organization. Browning, Howard, and Moderow (544) gave tests to the 2A and 3A pupils of Louisville, reclassified them in the light of the test results, made individual diagnoses wherever necessary, advised the wider use of work-type material, provided special coach teachers in some schools, organized committees to study the specific practices needed by every teacher, and prepared bulletins of suggestions for teachers. Two distinct features of each of the campaigns described are the initial study of the achievement and needs of pupils, as advised by Sangren (603), and the adaptation of instruction to provide needed help and guidance.

In an elaborate study extending over a period of years, W. S. Gray and Whipple (567) made a careful survey of the achievement and needs of pupils and of the content and methods used; studied the findings with the teachers and school officers; advised needed changes in methods, equipment, and teaching materials; conducted teachers meetings at which methods of improving reading instruction were discussed; directed committees in the study of special problems; and supervised classroom teaching more or less intensively. Objective studies of the progress made by the pupils supplied clear evidence of the value of campaigns to improve teaching through the application of the results of scientific studies of reading. That the improvement was permanent was shown by the results of tests given one, two, and three years after the training period terminated. The study showed also the need for and value of adequate supervision.

Concluding Statement

A critical study of the investigations which have been reported suggest numerous questions of which two will be mentioned here. First, what reason is there to believe that the relatively rapid improvement secured in some of the special training experiments will be permanent? It is apparent that many studies relating to school subjects should be continued longer or checked at subsequent periods in order to reach final conclusions. Second, how much dependence can be placed upon the types of tests which are used today in measuring achievement or progress in reading? An increasing number of criticisms have been made during recent years concerning the validity of current tests of comprehension. If the basic instruments of investigation are open to question, it follows that the results of studies which involve their use may be challenged. The foregoing questions and comments suggest the need of more rigorous scrutiny on the part of investigators of the methods employed in conducting scientific studies.

CHAPTER VIII

Science

THERE have been striking changes during the past few years in the point of view that is guiding practices in science teaching in the elementary school. The Committee on Science Teaching of the National Society for the Study of Education (629) pointed to the discrepancies existing between practices in teaching nature study and practices in planning the program of elementary education. The committee also offered recommendations designed to correct, in some measure, these discrepancies. A unique feature in the report of this committee is the emphasis on thinking, problem solving, generalizing, and influences of learning on behavior. The wide acceptance of these recommendations accompanied by the rapid development of new curriculum material sets the stage for productive research. Acceptable studies already support the conclusion that children can and do think, solve problems, and generalize on the basis of experiences with science material. But the conditions favorable to such mental activities and the extent to which they are possible and practicable have not yet been carefully studied. No one questions the effects of learning on behavior, but there are very great questions concerning the nature of these effects and the conditions under which they occur. This new development in science for the elementary schools seems to place greater emphasis on intellectual processes than is common in the divisions of instruction in this school unit.

The work in this field during the interval covered by this report has been developmental and relatively few carefully controlled researches have been reported. Reviews of studies of science teaching in foreign countries are included for their contribution to understanding of special methods and psychology of instruction as interpreted by educators of other countries. The studies reviewed are arranged under the following categories: (a) American trends; (b) trends in other countries; (c) curriculum; (d) the learning process; and (e) effects of learning on behavior.

American Trends

The Thirty-First Yearbook, Part I, of the National Society for the Study of Education (629) presented "a general plan for an integrated program of science teaching; an adaptation of this general plan to the successive grades of each of the administrative divisions of the public school; and a suggested program for the education of teachers." Meier (627) showed that the recommendations of this yearbook have influenced practices in many school systems. Trends which he noted after an examination of courses of study of recent issue show a tendency toward a well-balanced program of work beginning in the first grade and extending as a continuous, inte-

grated program of study through the secondary school. Clearly defined objectives are apparent and these function in the selection of materials included in the course of study.

In a historical study, Weller and Caldwell (634) outlined the major trends in instruction in nature study and in elementary science, particularly in the interval of 1870 to date. The contributions of content and method and the psychological background out of which these developments have come are briefly reviewed.

A committee headed by Weller (635) reported a survey of current practices. The report is based upon questionnaire returns from 172 schools distributed through 8 states. The average time allotment for science in these elementary schools was 72 minutes each week. Special science classrooms were in use in 20.4 percent of the schools. There were science museums in 22.1 percent of the schools. Methods and devices used in teaching in upwards of half of the schools included reading and discussion, experiments, projects, and field trips. According to this report some 56 percent of the schools used the unit plan.

A report by Hultz (624) is based upon an analysis of units of instruction submitted by the teachers of New York State to the state department of education. This analysis of general units gives an indication of the extent to which unspecialized teachers recognize science experiences in teaching.

Trends in Other Countries

Foreign trends show great variations, for the points of view guiding practices in foreign countries are by no means the same. Miller's report (628) of science teaching in France showed that the work is centered around objects particularly in the lower grades. For example, in the first two grades children are taught fruits and a few trees. In upper grades, this information is utilized in the study of orchard fruits and cereals. The program is outlined lesson by lesson.

Jones (625) reported observations of teaching science and nature study in the elementary schools of the Orient. He found effective work in progress in Japanese schools. Biological nature study was most in evidence in work with the younger children with increased emphasis on generalization following the fourth year. Special rooms were sometimes provided and experiences with science material are accepted as an established part of the curriculum.

Kilander (626) reported a thoroughgoing study of practices in science teaching in Sweden. His report is based upon study and analysis of printed matter and upon extended visitation in the schools. Science is taught as environment study through the first three years of the elementary school. This is closely similar to *Heimatkunde* of the German elementary schools. This study was introduced in order to effect a concentration of the foundation training in geography, nature study, and history and through certain projects to give training in drawing and sloyd. The aims of this subject

include that of giving the children a planned study in home and community environment. "It should develop ability to observe, widen their conceptions, give an opportunity for expression, and make them more familiar with their local environment." "Nature study" follows environment study and is continued through the last three years of the elementary school. This "aims to give instruction about nature with special emphasis on conditions of plant and animal life and the basis for human life and preservation of health."

Shoemaker (632) reported an equally thorough study of natural science education in German elementary schools. It is based upon extended observation in German elementary schools and upon analysis of printed matter used in these schools. "Natural science education in the German elementary schools begins in the *Grundschule* in the subjectmatter of *Heimatkunde*. It forms the basis for the educative values of the entire primary curriculum." Of the aims expressed in the courses of study of seven German states, the one with the highest frequency is, "Knowledge of appreciation of environment through actual observation of natural objects and phenomena." In Germany, as in Sweden, the organization of instructional materials is about centers of interest which are inclusive of the natural and social sciences. The study reports in detail the natural science content in the course of study in *Heimatkunde* for the *Grundschule* in Hanover.

These reports on work in foreign countries show wide diversities in practices in science teaching and in elementary education in general. No careful evaluation of outcomes from these methods has been made.

Curriculum Studies

Psychological considerations have determined, in large part, the character of curriculum studies. Robertson (631) has reviewed and evaluated the curriculum studies pertaining to elementary science. The contrast between recent and older studies shows clearly the influence of modern psychology on curriculum study. There is clearly a shift from curriculum material suggesting objects for study to material suggesting ideas, understandings, and effects on behavior.

Psychology of Instruction

Carefully controlled studies of procedures in learning are not numerous. The problem attacked by Haupt (623) is probably most significant for its potential influence on learning procedures. In their program for teaching science, the Committee on the Teaching of Science of the National Society for the Study of Education (629) urged that generalization should occupy a prominent place in the science work of elementary-school children. Freeman (622), among others, questioned this feature of the report, saying that to the young child, phenomena may be more nearly just phenomena-happenings. In an experiment carried through the first six grades

in an elementary school, Haupt (623) studied the ability of children to generalize with the range of phenomena suggested by the statement, "The sun is the chief source of energy for the earth." In this preliminary report of his more extensive study, he dealt only with the phenomenon of a green plant turning toward the light. From his results (briefly summarized in this article) he concluded: "The difference between the mental operations of the children of the first and sixth grades was not one of ability to generalize. The difference was one of complexity of the generalizations which were made." We must await his full report to learn whether or not there is adequate basis for this conclusion.

Robertson (630) investigated the relative effectiveness of a "study guide" and "developmental discussion" method of teaching elementary science in a fifth grade with respect to both immediate and delayed recall. Units as written by Craig (621) were considered suitable for the developmental discussion method. The same units were adopted by the experimenter (method not reported) for use with a study guide. Objective tests were used to measure the results. He reported the material selected appropriate for use by either method, but found no significant differences between the results obtained from the different experimental methods. The author stated (without citing evidence) that both methods give valuable training which informational tests cannot measure.

Arnspiger (620) reported a measurement of the effectiveness of sound pictures as teaching aids in elementary science. He used 950 fifth-grade children from 32 different classes in five different cities. The experiment utilized the "equated teacher" method. Pupils in the control groups were taught without the aid of educational talking pictures and pupils in the experimental groups were presented with three showings of a picture dealing with the topic undertaken during the regular class period. The showings were followed by discussions. The mean gain, as revealed by the testing was greater for the experimental group with every unit except one. Furthermore, the gains were statistically significant.

Effects of Learning on Behavior

Weller (633) studied the effects of instruction in elementary science on the attitudes of the children. In this case, the effects on attitudes were measured by study of the children's responses to test items including superstitions and popular misconceptions. Two units were selected and taught so that the attention of children and teachers was directed toward both attitudes and factual knowledge. Results from testing showed that equal gains were made in attitude and knowledge items. In a second part of the experiment three sets of tests were used: (a) a true-false test on attitudes, superstitions, and misconceptions; (b) a multiple choice test with items grouped in the order to measure observations, conclusions, and ability to verify conclusions; and (c) a test of factual knowledge. Three equated pairs of classes were used. In three of the classes attitudes and technics

were stressed, while in the other three, only factual items were discussed. Results showed that attitudes and skills may be more definitely developed when they are consciously kept before the pupils. The weaknesses in this study are evidences of the difficulties attendant upon research of this character. The reader will certainly question the adequacy of the investigator's definition of attitudes and the validity of the tests.

The development of science materials for use in elementary schools brings to the center of attention questions of mental growth. This has unique features, for emphasis in educational studies in the elementary school has been upon learning the tool subjects. This new development promises to add to the experiences of young children a large measure of enrichment.

CHAPTER IX

Social Studies[1]

RESEARCH in the social studies at the elementary level is not extensive. The chaotic condition of the content and objectives, the exceeding difficulty of securing definitive results, and the concentration of investigators on the high-school level are some reasons for the paucity of results. While the following summary is in general restricted to the elementary level, some studies which are applicable at all grade levels are reported.

The problem of objectives will illustrate a typical difficulty in the social studies. Socially desirable conditions and ideals of economic justice appear to some as educational objectives. It would be rash indeed to say that the schools have nothing whatever to do toward achieving these ends, but the line of demarcation between goals attainable in or through the schools, and those which must involve all society is not easily discernible. Confronted with such a problem, it is small wonder that social studies teachers are bewildered and hesitant. Slowly, however, the research of patient teachers is producing some results. We are making some progress in the selection and grading of materials, and we are learning how to perform some small tasks with a great degree of skill.

The outward forms of a valid study in the field of the social studies are discernible. It is somewhat easy to select those studies which have the appearance of scientific exactness. In view, however, of the numerous and uncontrollable factors which operate in this field, it is exceedingly difficult to be sure that an apparently valid study or experiment is in reality valid. Conversely, it is dangerous to reject unceremoniously those studies which are lacking in some of the outward appurtenances. Consequently, the following summary tends toward inclusive mention to a greater degree than absolute scientific standards would allow. Even when this liberal procedure is followed many studies will fall outside the scope of this digest.

Three groups of studies are not included: (a) those which seem to apply primarily to the high-school level and which do not have obvious applications to the elementary school; (b) those which seem to have been carried on in such a way as to guarantee no assured conclusions; and (c) those which have not come to the attention of this reviewer. In view of the varied places of publication, the numerous repositories of theses, and the enormous number of so-called studies, the reviewer asks for the indulgent charity of the reader.

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[1] Acknowledgments for assistance in the preparation of these reviews are due Marian Compton and George Engberg, graduate students at the University of Minnesota.

Bibliographies

Bye (646) compiled a useful bibliography on various aspects of teaching the social studies. It includes both elementary and secondary titles. On the basis of accuracy, literary merit, and pedagogical usefulness F. H. Wilson and H. E. Wilson (702) compiled a list of about 500 titles of American biographies useful for pupils of the upper grades as well as for those of high-school age. F. H. Wilson and Atwood (703) prepared a useful and fairly complete bibliography of recent materials on the social studies curriculum.

The School in Its Social Setting

Pierce (676) listed and gave a brief account of the activities of those organizations which seek to influence the teaching of the social studies. This is an objective, informative study with little discussion as to the significance of the facts. Swingley (689) made an inclusive study of the legal requirements concerning the teaching of the Constitution. Forty-three states have laws which require the teaching of the federal Constitution and twenty-four have similar provisions for the teaching of the state constitutions. Most of these laws were passed since 1920. The American Bar Association and the National Security League were the two most active organizations which sponsored such legislation. Shilling (684) found that most states have laws requiring the teaching of government. Some provide for elementary courses, some for high-school courses, and some for colleges. Many states specifically require the teaching of the United States Constitution, the state constitution, and citizenship in general. Unfortunately, Shilling gives no tabular summary.

Dondineau (651) sent a questionnaire to 116 high-school and 152 intermediate teachers in Detroit and secured their reactions to ten questions. About 98 percent of both groups favored the teaching of controversial subjects. More than one-half believed in the teaching of specific attitudes. Nearly all believed in teaching current events. The great majority, 95 percent of the high-school and 87 percent of the intermediate teachers, believed in history as a distinct subject. The only question which brought forth any significant divergence of opinion related to the relative cultural value of subjects and social science. Seventy-two percent of the high-school teachers and only 53 percent of the intermediate teachers believed that subjects were superior in this respect to a general social science course. Brigham and Dodge (644) traced the history of geography textbooks and showed the trend toward a more appealing, interpretative content.

Administrative Problems

Bloomfield (643), on rather slender bases, suggested that large classes in American history do about as well as small classes. Davis and Goldizen (650) taught two matched groups in seventh-grade history and concluded that a class of 70 was as successful as one of 35.

Materials and Equipment

Baldwin (639) examined 132 courses of study and 32 books on methods in order to compile an ideal list of materials and equipment. He then visited 32 schools and secured reports from 388 teachers and administrators. From these two sources he constructed lists of desirable equipment for various grade levels. Mason (669) examined the maps in 32 geographies published between 1845 and 1929. He found the political map dominant until 1921, when it was succeeded by the physical-political type of map. The change in maps indicates the general trend in geography toward an interpretative treatment. Mandeville (668) proved that children prefer reading materials which contain explanations over the purely factual type. Compton (647) set up criteria for evaluating history texts. She has published a checklist and an explanatory manual. E. M. Wilson (701) examined five recent and widely used texts in geography. With the support of teachers and supervisors she concluded (a) that geography texts indicate poorly discerned objectives; (b) that desirable relations are not developed; (c) that too many technical terms and principles are used; and most significant of all, (d) very inadequate provisions are made for the development of skills.

The Curriculum

H. E. Wilson (704) analyzed ten fusion courses and concluded that "fusion in theory is not, in and of itself, superior to subject organization of materials." He stated that the good features, such as functionality and psychological appeal, are not peculiar to fusion, and in fact are found within subjects just as frequently as in fusion. He pointed out that 645 of the 862 generalizations compiled by Billings (642) are used in only a single field. He suggested that the fusion movement came too late, that the desirable objectives which it sought were already being achieved within the subjects themselves. Stull (688) examined twenty-five courses in the social studies and found that geography occupies a rather subordinate position, especially in junior high schools. He observed that the term "social studies" has frequently been applied to the whole program of social subjects with no real changes involved. Wilcox (699) analyzed the fusion courses described in the six state and twenty city syllabi which were available in 1931. He concluded (a) that many so-called fusion courses were in reality examples of correlation or alternation; (b) that the concepts of fusion are still in the formative stage; and (c) that the fusion courses for the grades have a subject core content. Kelty (662) summarized the studies dealing with the process of learning history in the middle grades. Her article dealt with objectives, materials, and the grading and organizing of materials. She concluded (a) that little work of a scientific nature has been done on the problem of grade placement; (b) that the organization of materials in large units is an improved scheme for the middle

grades; (c) that geography and history should be taught as separate subjects; and (d) that objectives should be realistically conceived and stated in terms of the actual outcomes. Pritzkau (679) found that junior high-school pupils are interested in materials dealing with adventure, war, travel, communication, life and customs, and mechanical improvements. Williams (700) found that we are quite unsuccessful in teaching biography. He asked 2,216 pupils in junior and senior high schools to name twenty-five leaders in human affairs with the reason for selecting each name. One thousand six hundred ninety-one different persons were mentioned as leaders. Many pupils could name fewer than ten leaders and a few could name more. Junior high-school pupils were more successful than those in senior high school. Many papers revealed a faulty sense of value, but there was marked ability to distinguish between real and imaginary characters. Political and military heroes and living persons were most frequently selected. Bible characters, classical names, and movie actors appeared infrequently on the lists. Deeds rather than qualities marked the reasons for selection. This study has significance for the curriculum maker and the textbook writer. Gunderson (654) found little duplication in 40 primary readers and almost no geographic material in them. Roach (681) examined 7 junior high-school texts in American history and computed the percent drawn from the other fields: economics, 18 percent; government, 15 percent; geography, 12.6 percent. This study seems to indicate that one of the objectives of the fusionists is being achieved through subjects. Rosenbloum (682) examined 5 junior high-school texts in American history and found a total of 857 different persons mentioned. Only 136 of these names appeared in all five of the texts. Statesmen, artists and musicians, military men, colonizers, scientists and inventors, explorers, educators, and religious leaders appeared in the order of frequency in which they are here mentioned. Reed and Wright (680) listed the interests of the children of the primary grades—communication, transportation, industries, the community, and people of other lands. Sisson (686) and Phinney (674, 675) attacked the statistical procedure in the selection of curriculum material and cited instances of its inadequacy.

Problems in Learning

Hart (656) collected and classified errors in geography. Many errors reported arose from inadequate vocabularies. Words such as "mouth" and "source" are frequently confused, and abstract terms like "climate" and "longitude" cause difficulties. Other errors arose from lack of skills and abilities, from misconceptions, and from confused associations. Teachers are guilty of all the errors reported and are probably the source of many of them. Howe (660) examined 1,300 children in grades three to six to ascertain their sense of direction. He found (a) that children do not acquire a knowledge of directions until they study geography; (b) that more than half of the pupils from grades three to six knew the directions, but that

many errors were made; (c) that children are likely to associate directions with some local object rather than with natural phenomena; and (d) that boys appear to know directions better than girls. He suggested more drill in the teaching of directions. Aitchison (636) studied the numerous misconceptions concerning the use of the word "zone." He recommended the elimination of all mention of zones from fourth- and fifth-grade geography and the substitution of such terms as "low, middle, and high latitudes." Hoppes (659) found that pupils of the fourth, fifth, and sixth grades have very poor abilities in reading pictures for geographic purposes. Thorp (692) studied the ability of pupils in grades four to seven to read globes and maps, to use indexes and appendixes, and to construct and understand graphs. He concluded that incidental teaching of the use of geographic tools is a failure. He urged a more systematic grading of such skills and gave a suggested scheme. He stated that the circle graph is a junior high-school problem and that the bar graph is more difficult than the line graph. Thomas (691), after studying the performance of 355 pupils in grades four to seven, concluded (a) that the line graph is the most difficult; (b) that picture graphs, two-dimension diagram graphs, and circle graphs are the easiest for pupils of all grades; (c) that superior fourth-grade pupils can understand simple graphs; and (d) that seventh-grade pupils, with proper instruction and explanation, can interpret all simple graphs. Shaffer (683) studied the ability of pupils from the fourth to the twelfth grades to interpret cartoons. He concluded (a) that such interpretation improves markedly between ages twelve and fifteen; (b) that the process of reasoning and the types of errors are similar to those involved in reading; and (c) that junior high-school pupils can make abstract interpretations of cartoons.

Study Methods

Barton (641) undertook to ascertain the value of outlining in the study of ancient history, geography, and American history. Matched groups in three types of school were employed. The variable factor consisted of direct and regular instruction in outlining. On the basis of subjectmatter tests the experimental groups made greater gains than the control groups. The differences were, with the exception of one unit, statistically significant. Fowlkes (652) has probably thrown some light upon the question of whether the study period should follow or precede the recitation. On the basis of a rather inconclusive experiment, he thought the study-recitation plan better than the reverse for the 7B class in American history. Newlun (671) studied the effect of teaching the art of summarizing. On the basis of experimenting in three schools for twelve weeks he concluded (a) that fifth-grade pupils can be taught to make creditable summaries; (b) that such training is probably more effective than conventional study methods; (c) that such training is unlikely to affect achievement in reading; and (d) that such training does not interfere with achievement in other direc-

tions. Simpson (685) undertook to determine the effect of specific training on ability to read historical materials. The scores from 606 pupils from the fifth, sixth, and seventh grades in and near Pittsburgh were utilized as the basis for conclusions. He found (a) that reading ability improved upon receiving training in answering questions, in evaluating, in outlining, and in summarizing; (b) that organizing of materials should precede attempts to answer questions; (c) that outlining was the most effective single method used; and (d) that specific training in answering questions, evaluating, outlining, and summarizing was more effective than the usual classroom procedure. Weaver (697), in two cautiously reported experiments, indicated that on the basis of test scores extensive reading is certainly as effective in American history as is intensive reading. He suggested that too much written work may be required in history. Winch (705) concluded that dates are easier to learn than centuries and that the teaching of specific dates results in a much greater aggregate of chronological knowledge. Wrinkle (709) taught a control group by assignment, study, and recitation and an experimental group by the same steps applied to the whole unit. He found that the latter method was superior in subjectmatter acquired, in increased interest in additional reading, in improved study habits, and in pupil preferences. He recommended a compromise between the short daily assignment and the long inclusive unit. Wright (708) concluded that motivation by means of pupil-prepared questions or by a teacher-prepared guide greatly increased the results of study in fourth-, fifth-, and sixth-grade history. He failed, however, to give a sample of the guide, to tell just where the experiment was conducted, the exact number of pupils, and how the materials differed in the various grades. Johnson (661), in a sadly misnamed volume, summarized some outstanding steps in the history of methods of teaching history. He contended that everything worthwhile in method has been known and utilized for many years. He is somewhat scornful of much of the work in education. Simpson (685) found that children in grades five, six, and seven of Allegheny County, Pennsylvania, schools were able to organize historical materials better if they first had training in answering questions, evaluating, outlining, and summarizing. Outlining appeared to be the most valuable operation and the one which should come first in the sequence.

Problems in Teaching

Van Bibber (693) discovered that almost every step in the teaching process was beset with difficulties. She recommended (a) few topics, (b) more careful grading, (c) elimination of some topics, and (d) more ample provision of materials. Wirth (706) described 71 difficulties which were reported by 1,417 teachers. Some of the difficulties pertain to pupils, some to materials, some to social situations, and some to shortcomings on the part of the teacher. Cox (648) compiled a great number of difficulties and

classified them into 86 types. One of the interesting outcomes was the discovery of the inability of teachers to define their difficulties.

Baker (638) simplified the reading materials for 300 eighth-grade pupils in history. He found that simplification by synonyms was not effective, but that the substitution of equivalent but simpler phrases did effect an improvement in understanding. Weaver (696), after studying two control groups, each of twenty-one seventh-grade pupils, concluded that formal instruction is better than informal instruction for the elimination of errors in written work in history when used on groups of average or near-problem pupils; it also appears from this study that superior pupils progress equally well under either method of instruction.

Geedy (653) found that, in geography, slides before the lesson were more effective than graphs used to supplement the study period. Knowlton and Tilton (665) studied the effects of motion pictures upon a seventh-grade class in American history. They found that the pictures effected a gain in causal relationships and in knowledge of persons and places. The experimental group evidenced, however, a distinct loss in time relationships. In a later study they (664) found that motion pictures were more effective in the classroom than when shown in the auditorium. Meador (670) studied the effects of still films upon 420 geography pupils from grades four to seven. He concluded (a) that such pictures were a distinct asset in the study of foreign geography; (b) that instruction supplemented by visual impressions is more effective than instruction alone; and (c) that visual impressions contributing to and forming the basis of verbal instruction constitute the most effective way to teach geography. Terry (690) discovered that junior high-school pupils are more interested in the people featured on the screen than in any other type of material. Way (694) reported that 40 percent of the 44,186 motion pictures used in 517 schools were devoted to the social studies. Wolfe (707) concluded that superior children profit least from motion pictures.

Vocabulary Studies

Using eight senior high-school texts, Barr and Gifford (640) compiled a vocabulary of American history. Proper names, the first 3,000 words of Thorndike's list, and other groups were excluded. Seven thousand six hundred thirty-one different words occurred in the eight texts. The final list consists of the 1,900 most frequently used words. Hatch (657) discovered that 99 percent of his American history list of 1,082 words would probably cause difficulty. He concluded that the average text in American history for the senior high school is too difficult. Hathaway (658) concluded that history texts designed for the fourth grade contain too many difficult words. After equating two groups from the 4B grade, Kueneman (666) studied the relative difficulty of selections from the text and selections simplified by rewriting. He found that such simplification aided understanding to a rather slight extent. Parker (672) discovered that texts in modern European

history possess a needlessly difficult vocabulary. L. C. Pressey (678) compiled a vocabulary of 228 words in elementary-school geography. Pressey and Pressey (677) compiled a vocabulary of 384 words in elementary American history. Stephenson and McGehee (687) found a list of 283 words which are common to both civics and American history. Kelty (663) compiled a word list of American history for the middle grades. The list consists of 711 words and terms, 83 percent of which appear in Thorndike's list. Each word is checked to indicate its appearance in various other lists. The compiler suggested specific exercises and drills to insure an understanding of the terms. Brown (645) examined 10 sixth-grade readers and histories for the difficulty of the diction. He found the histories more difficult than the readers—so much more difficult that he suggested the advisability of rewriting the former. Lacey (667) studied the social concepts of 450 children in the first three grades. The unique aspect of her technic was the use of tests based upon pictures. She proved that children of the first three grades have little conception of such abstract terms as "thrift," "patriotism," "industry," and "courtesy"; that differences within grades are more significant than between grades; that the curriculum has a direct bearing upon the understanding of the concepts; that concepts involving personal relations are more difficult than those involving objects; and that the many misconceptions revealed point to the necessity of more careful teaching. Harrison (655), by interviewing 160 children, studied the nature of fifty commonly used concepts of time and their development from the kindergarten through the third grade. She reported a gradual development from grade to grade. In fact, the correlation between the development of time concepts and grade advancement is .66. This, and several other studies, seem to indicate that our grade placement of materials is not the woeful failure which is so often depicted. The author showed, however, that the correlation between grasp of time concepts and mental age is .70. The author does not name any of the concepts studied. Two articles on the subject of vocabulary studies may prove useful to those who plan research in the field. Dale (649) gives some specific suggestions, and Wesley (698) raises some problems concerning the use of word lists.

Measurements

Weaver and Traxler (695) found that essay and objective tests are about equally valid when the essay test is scored as objectively as possible. Anderson and Lindquist (637) analyzed the meaning of the term "achievement tests" and gave suggestions for the construction of valid items. Peters and Altman (673) made a critical study of standardized tests in American history. They examined twenty-three tests which appeared between 1916 and 1929. They classified 67 percent of the items as political, 22 percent as social or economic, and 10 percent as military. Tests tend to pay scant attention to recent events. In general, they fail to show a very close agreement with scientifically ascertained standards in respect to proportion, dates, names, and areas explored.

CHAPTER X

Spelling

THIS summary of investigations in spelling covers the period from January 1, 1931 to June 30, 1934. It is confined to published studies and continues, in similar form, the summary that appeared in the *Review of Educational Research* for a like period three years ago. The content of the investigations, of which there are 67, will be discussed under the following major headings: (a) bibliographies; (b) selection and gradation of vocabulary; (c) methods of instruction; (d) measurement of achievement; and (e) deficiency and diagnosis. Inasmuch as a previous number in this cycle of the *Review of Educational Research* discussed curriculum problems in various subjects, including spelling, attention will here be given chiefly to spelling problems outside the field of the curriculum.

Bibliographies

During the period under consideration a number of helpful bibliographies have appeared. Foran and Sister Mary Carmela (731) prepared an annotated bibliography of 82 references to supplement the bibliography of Sisters Mary Irmina, Mary of the Visitation, and Mary Gabriel which appeared in 1928. Breed (714) summarized the results of 83 studies, covering the period 1928-30. Zyve (776) prepared a summary of 57 investigations, reports of which were published during the same three-year period. Gray (746) compiled an annotated bibliography of a selected list of 17 investigations, the results of which were published during the year 1931-32. A similar bibliography of 12 entries for the following year was contributed by Breed (713). Most recently of all, Horn (750) reviewed 44 studies that were published during the triennium ending November 1, 1933.

One of the undesirable features of this bibliographical work is the duplication of effort. Reviewers working presumably in different fields frequently use identical material in identical manner. Another is the frequent failure to report the result of an investigation.

Selection and Gradation of Vocabulary

The interest in children's out-of-school writing as a source of words for the spelling vocabulary, continues to grow. Driggs (726) made a study of word usage in 192 letters of pupils twelve to fifteen years of age. His results are quite similar to those previously reported for college freshmen and adults. Fitzgerald (727) found the frequency of use and of misspelling for 7,587 different words appearing in children's letters. He showed the disparity between the word usage of children and that of adults, and pro-

vided new data on the distinctive elements in the vocabulary of children. It is true, as Horn (750) pointed out, "that the overlap between the writing needs of children and adults is so large as to furnish, grade by grade, an abundance of words which pertain to the child's present needs and to his future needs as well." Nevertheless, Fitzgerald's data confirm previous conclusions to the effect that limiting the spelling vocabulary to this common element would exclude a considerable number of words that, as indicated by frequency of usage, are more important for the child than many otherwise included. It is the old question of permanent versus temporary values in curriculum making, the question as to whether the spelling vocabulary should be confined to material that directly meets the needs of maturity. The facts are clear; the principle is in dispute. Fitzgerald (728) also presented the 2,106 words of highest frequency in 3,184 personal letters written by children in the fourth, fifth, and sixth grades. On the basis of adult usage and the results of a survey of children's written English, Schonell (764) selected a list of 3,200 words for elementary schools in England.

As if further reminders were necessary, two articles suggest the lag between scientific knowledge and its social application. The first is an argument for simplified spelling, by the secretary of the Simplified Spelling Board (725). The economic waste due to our conventional spelling is estimated to exceed $1,000,000,000 a year. Experiments indicate, we are informed, that our present irrational spelling wastes at least a full school year in the life of every English speaking child. If reason could overcome the inertia of habit, if science could be substituted for the passionate worship of vestigial and irrational linguistic symbols, millions of elementary-school children might be freed from an enormous and an unnecessary burden. Croissant (723) discussed the difficulties encountered by the movement to establish simplified spelling. Coleman (718) undertook a critical analysis of methods of vocabulary determination and concluded that emphasis should be placed on the writing of both children and adults as source material. He rounded out his investigation with the selection of 3,017 words for use in the public schools.

In a series of articles that has recently eventuated in a book, Foran (730, 735) reviewed the important literature relating to the selection of the minimal word list in spelling, and, as regards method, reached essentially the same conclusion as Coleman. As to the size of the minimal list, he concluded that 3,800 is approximately the desirable number of words, this being the median number among 13 spellers in common usage. Foran (733) also examined the gradation problem, and concluded that the spelling vocabulary should be graded on the basis of "children's experiences with the meanings of words." Wise (774) also touched on gradation, reporting the results of a comparative study of 20 modern spelling texts. His results confirm those of other similar studies, in that great variability was found in the grade location of the same words in different texts.

Methods of Instruction

Basically, a method of instruction is a mode of directing learning activities. Instructional method should therefore rest on knowledge of the learning process. Hence, the persistent search for the fundamental factors in learning to spell.

Factors in learning—By analyzing 39 reports bearing on the topic, Williamson (772) derived the following as the factors which are important in learning to spell: (a) span of apprehension; (b) knowledge of meanings; (c) verbal intelligence; (d) perception of word form; (e) generalization of phonetic units; (f) rote memorizing; and (g) desire to spell. Williamson (773) also reported the results of an experiment from which he concluded that the conception of special disability in spelling should be discarded and that more attention should be given to skills of learning and general intelligence as important factors. Experimental data reported by Hartmann (748) seem to agree with the results of previous investigations that spelling ability is not a function of general visual perception, but depends upon immediate memory for meaningful visual stimuli. By Frandsen (737) it was shown that spelling efficiency has little or no relation ($r = .11 \pm .06$) to differences in the pleasant or unpleasant connotations of words.

Procedures and devices—Prehm (761) showed the improvement that ensued when pupils were properly motivated, grouped according to ability, given differentiated assignments, provided with individual instruction, and informed of progress. Zyve (775) in an extensive experiment made a number of comparisons of different methods of instruction and found most of the differences in results to be small. Four reports deal with aspects of the pretest method. Gates (741) found that the test-study method was inferior to the study-test in grades two and three. In an experiment conducted by Gates and Bennett (742) it was found that the test-study method operated more effectively in the primary grades with two tests per week than with three. After an experiment devoid of proper controls, Kirby (755) concluded that the test-study method is inferior to traditional methods. Springsteed (767) proposed a modified form of the pretest method. Miller, Courtis, and Watters (758) prepared a type of manual for persons interested in applying the project method to spelling, but reported no measurements of effectiveness. As an outgrowth of an eye-movement study, Gilbert (744) compared a flash-card method with a form of the pretest method. The most significant factor in the results seemed to be the limitation of time and its effect on application. As regards the flash-card, few would deny its efficacy as a device; few would claim its adequacy as a method. At the end of a three-year experiment, Garrison and Heard (739) found no significant difference in spelling ability between primary pupils trained in phonetics and those not so trained. Data on handwriting difficulty in spelling and on the relative difficulty of the various letters of the alphabet for primary pupils were provided by Hanson (747). Hughes (751) reported bene-

ficial effects from differentiating both pupils and courses. Dean (724) outlined a plan of individual instruction to be used with any textbook, and Frostic (738) shed interesting light on methods employed in some of the earliest American spellers.

Generalization of ability—Caught in the web of our irrational spelling, we are still trying patiently to determine the extent to which formal rationalization is possible in instruction. Wheat (771) formulated four spelling rules of rather wide applicability. Their value in learning to spell should be determined by experiment. King (754) studied the results of applying seven carefully selected rules, then cautiously concluded "that all except two of the rules . . . were understood and applied by grade children with enough success to warrant further study." In a collection of more than 100 spelling rules, Sartorius (763) found fourteen that applied without exception to the spelling of 202 words in a minimal list of 4,065. Someone should now determine whether or not the 202 words can be mastered more economically with than without the use of rules. Carroll (716) showed quantitatively the greater tendency of bright pupils, as compared with dull, to generalize in spelling. As a result he (717) concluded that "likenesses between words in syllabic structure, in configuration, and in phonogrammatic units should be pointed out, and bright children will benefit." Garver (740), like Carroll, presented experimental evidence of the operation of generalization in spelling, and, in line with the results of previous experiments favoring the grouping of words according to identical elements, asserted that fairly constant irregularities and peculiarities, fairly uniform changes of primitives in making derivatives, and the like, demand special attention. In the light both of psychological principles and spelling research the recommendations of Carroll and Garver seem perfectly sound.

What above sixth grade?—For some time data on time allowance have indicated a decline of emphasis on spelling in the seventh and eighth grades. We seem to be tending toward a plan of completing the formal study of spelling in the sixth grade. However, many junior high schools that have discontinued the study have been haunted by the vexing problem of spelling deficiency. Recent investigations indicate a search for an economical method of meeting this situation. Forman (736) reported the results of the campaign method; Coverdale (721), those of the contest method. In the latter case, six high schools joined in a league of competition after adopting the same list of words. Even though these plans led to improvement in spelling, they do not seem to present the last word in the way of a solution. A plan seems to be demanded that rests on dependable incentives and gives greater assurance of uninterrupted success. A simple scheme that seems to be in considerable favor is illustrated by practice in the Theodore Roosevelt High School, New York (766). Eight spelling lists of 100 words each are submitted to pupils with suggestions designed to aid them in independent study. Urell (770) described a similar scheme adopted elsewhere. Anderson and Traxler (711) reported the re-

sults of an economical and effective plan of corrective group instruction for the removal of spelling deficiency among pupils in the seventh and eighth grades. Connelly (719) showed how the same kind of situation was met by the use of six minutes daily in English classes. There is obviously a need for a new type of course at this level, one sound in vocabulary, adequate and scientific in study guidance, workable on an individual basis, and markedly economical of the teacher's time. There is a gleam of consolation if not of hope in the results of an experiment by Gilbert (743), who called attention to the improvement in spelling ability from year to year in the high school regardless of the presence or absence of spelling instruction, and showed that this improvement is due, in part at least, to incidental learning in connection with reading.

General and comprehensive discussions—Several writers on spelling problems have presented overviews representing their reactions to a considerable body of the literature. Kyte (757) derived thirty-five principles for use in the teaching of spelling. Breed (712) endeavored in a short article to indicate the major trends in the field. Foran (732, 734) discussed the general type of instructional method to be employed and the major problems in the presentation of words. Almack and Staffelbach (710) reviewed the results of certain important investigations, the conclusions of numerous minor studies, and the opinions of textbook writers. Their discussion might have been improved by a more serious attempt to resolve contraditions at critical points and to show the trend indicated by the most reliable research.

Measurement of Achievement

Cook (720) conducted three experiments relating to technic in the measurement of spelling ability. The first dealt with the selection of test words, with special reference to difficulty and discriminative value; the second and third, to the evaluation of six self-administering test technics. The double-alternative spelling test was found by Phillips (760) to be low in validity ($r = .69$), much lower than the ordinary dictated-recall type. Kelley (752, 753) reported a study of five technics used in the measurement of knowledge of the meanings of words, including the familiar multiple-choice test, and concluded that, while all were high in reliability, none was high enough in validity for satisfactory individual measurement. Thurstone (768), in agreement with previous investigators, found that for greatest validity of measurement, other things equal, the mean percent of correct spelling for the group measured should be about 50. Contrary to the common assumption, Capron (715) concluded that the order of arrangement of items in spelling tests has little effect on the scores of pupils in the upper elementary grades.

Deficiency and Diagnosis

In four instances studies of misspelled words were reported. Crawford and Garrison (722) showed the disagreement between a list of words mis-

spelled by seventh- and eighth-grade pupils and other lists of most commonly misspelled words. They also showed the extent to which the words in their list were found among the later thousands or not at all in the Thorndike list. Hayes (749) published a small list of words misspelled by junior high-school girls in courses on clothing, and Kramer (756) the seventh instalment of a study of words misspelled by adults. Fitzgerald (729) made the most extensive study of misspelling during this period, reporting results based on 20,142 errors found in 460,906 running words of letters written by children in the fourth, fifth, and sixth grades. The remaining reports may be classed in the field of individual diagnosis. Muchow (759) determined the causes of spelling deficiency in two cases, one of difficulty in articulation, the other of difficulty in the perception of form. After investigating causes of weakness in spelling, Selzer (765) concluded that deficiency may be attributed in many cases to a disturbance of lateral dominance in the cerebrum. Ulrich (769) and Roback (762) did not fully agree on the causation of lapses. The former offered a Freudian explanation. The latter rejected the Freudian view of unconscious motive and concluded that "the principles of preservation and assimilation as explanatory of most of our lapses are . . . established beyond a doubt." Finally, Gilbert (745) reported the results of an investigation that has suggestive value for educational diagnosticians. The investigation showed the possibilities of the photographic method in the study of cases of spelling deficiency.

Reflecting on the data of objective studies, one can hardly avoid the conclusion that the objectives of spelling instruction are quite clearly determined. The words that should be taught are fairly accurately known. But the teaching of spelling still appears to be needlessly stiff and formal. If few new principles of instruction come to the surface in a summary for a triennium, the chief problem naturally becomes that of applying with increasing skill the principles already established. This, it seems to the writer, is the important task for the immediate future.

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